GSMA

# The Mobile Economy Europe 2025

# GSMA

The GSMA is a global organisation unifying the mobile ecosystem to discover, develop and deliver innovation foundational to positive business environments and societal change. Our vision is to unlock the full power of connectivity so that people, industry and society thrive. Representing mobile operators and organisations across the mobile ecosystem and adjacent industries, the GSMA delivers for its members across three broad pillars: Connectivity for Good, Industry Services and Solutions, and Outreach. This activity includes advancing policy, tackling today's biggest societal challenges, underpinning the technology and interoperability that make mobile work, and providing the world's largest platform to convene the mobile ecosystem at the MWC and M360 series of events.

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# Executive summary

## Sustaining global competitiveness

Digital infrastructure has been at the heart of social and economic progress in Europe for the better part of the last three decades. Today, nearly half a billion people across Europe are connected to the mobile internet, predominantly through high-speed 4G and 5G networks. Mobile technologies and services now generate around 5% of GDP across Europe, a contribution that amounts to almost €1.1 trillion of economic value added. 5G, in particular, is expected to benefit most sectors of the European economy, adding around €164 billion of economic value by 2030. However, achieving further growth beyond this will be challenging within the constraints of the current regulatory environment.

Consequently, Europe is at a crossroads in the development of crucial digital infrastructure, with key network-performance and consumer-adoption metrics showing that it is falling behind some of its global peers. This underlines the need for urgent action by the European Commission and other authorities to implement critical policy reforms to ensure that Europe's digital economy – underpinned by strong, sustained network innovation – can re-establish a leadership position in the global tech race by 2030.

# Key trends shaping the mobile ecosystem

## The focus shifts to 5G standalone and 5G-Advanced

By the end of 2024, 5G accounted for 30% of mobile connections in Europe, equivalent to over 200 million connections. However, 5G has not yet materially altered mobile revenue growth, which remains low in most European markets. Shifting investment to more advanced forms of 5G, particularly 5G networks based on the standalone (SA) architecture, as well as 5G-Advanced, will be important to unlock new use cases and monetisation opportunities. However, this investment will not occur automatically, and issues that limit the mobile sector's capacity to invest will need to be addressed first.

## GSMA Open Gateway gains traction

As of December 2024, 67 operator groups had signed up to the GSMA Open Gateway initiative, accounting for 75% of mobile connections globally. The geographic breakdown of operator commitments indicates regions at par, above or below their established market share. Europe is a leading region, with committed operators representing more than 20% of GSMA Open Gateway commitments despite accounting for around only 10% of mobile connections. Many of the early API launches in the region have focused on fraud prevention and security, using SIM Swap and Number Verification APIs. These represent easy wins, given the ever-present risks from fraudsters and breaches for operators and their customers.

**By the end of 2024, 5G accounted for 30% of mobile connections in Europe, equivalent to over 200 million connections**

## Driving AI transformation responsibly

European operators are leading the way in generative AI (genAI) adoption, with a strong emphasis on network optimisation, security and enhanced customer service. Mobile operators are catalysing genAI innovation through strategic partnerships, exemplified by Telefónica's collaborations with technology partners, as well as Deutsche Telekom's development of telecoms-specific large language models (LLMs) with the Global Telco AI Alliance. To foster responsible AI, operators are prioritising ethical AI practices to ensure fairness, protect users and reduce inequalities. The EU's AI Act sets regulatory standards for responsible AI, while the GSMA's Responsible AI Maturity Roadmap offers a framework for ethical AI use.

## Momentum builds behind aerial connectivity

Terrestrial networks remain the primary form of connectivity, supported by the wide area coverage of wireless networks and the mass production and adoption of mobile devices. In recent years, however, technological advances in various satellite and other non-terrestrial networks (NTNs) have helped to overcome several limitations associated with aerial connectivity. Recent developments suggest that European authorities are taking steps to keep up with their global peers in the development and application of satellite connectivity, as a complement to terrestrial-based mobile connectivity services. Recent examples include the award of a contract to the SpaceRISE consortium to develop, deploy and operate the IRIS[2] constellation, as well as the emergence of new players across the European satellite ecosystem.

# Policies for success

Addressing Europe's digital infrastructure needs is an important first step towards resetting the regulatory framework for telecommunications and re-energising the European telecoms sector as an engine of competitiveness and prosperity. The benefits of increased investments in digital infrastructure will not only be felt across the telecoms and technology sectors but across every other industry as well. Achieving this requires a bold new approach to realising the Commission's digital single market ambitions, underpinned by the following practical measures:

- **Re-evaluate the existing regulatory framework** that was conceived 20–30 years ago, and update the policy objectives and principles to match today's market realities and challenges.

- **Implement additional measures to ensure fairness in the internet value chain** by defining an obligation on content and application providers (CAPs) to negotiate with internet service providers (ISPs) on the terms and conditions for IP data transport services, thereby making the negotiating parties subject to a dispute resolution process in the event that an agreement cannot be reached.

- **Take a more long-term view on investment and innovation effects.** The Commission needs to initiate a review of the EU Merger Regulation, which has not been reviewed for 20 years, in order to put more emphasis on the long-term investment viewpoint.

- **Establish a pro-investment approach to EU spectrum policy**, including the adoption of best practices to achieve a more predictable and harmonised approach to spectrum auction designs, licensing costs, the prolongation of licences and the identification of future bands.

- **Apply circular economy principles to network equipment** and incorporate the EU taxonomy for green investment in electronic communication networks, based on robust metrics.

**The benefits of increased investments in digital infrastructure will not only be felt across the telecoms and technology sectors but across every other industry as well**

# The Mobile Economy Europe

## Unique mobile subscribers

**2024** **520m**
**88%** penetration rate*

**2030** **527m**
**89%** penetration rate*

CAGR 2024-2030 | **0.2%**

*Percentage of population

## Mobile internet users

**2024** **471m**
**79%** penetration rate*

**2030** **494m**
**84%** penetration rate*

CAGR 2024-2030 | **0.8%**

*Percentage of population

## SIM connections
(excluding licensed cellular IoT)

**2024** **795m**
**134%** penetration rate*

**2030** **816m**
**138%** penetration rate*

CAGR 2024-2030 | **0.4%**

*Percentage of population

**4G** Percentage of connections (excluding licensed cellular IoT)

**2024** **63%**

**2030** **18%** ⬇

**5G** Percentage of connections (excluding licensed cellular IoT)

**2024** **30%**

**2030** **80%** ⬆

## Smartphones
Percentage of connections

**2024** **83%**

**2030** **91%** ↑

## Licensed cellular IoT connections

**2024** **322m**

**2030** **545m**

## Operator revenues and investment

**2024** **€163bn**
Total revenues

**2030** **€177bn**
Total revenues

Operator capex for the period 2024–2030: **€175bn**

## Mobile ecosystem contribution to GDP

**2023** **€1.1tn**
**5.0%** of GDP

**2030** **€1.2tn**

## Public funding

**2023**

**€120bn**

Mobile ecosystem contribution to public funding (before regulatory and spectrum fees)
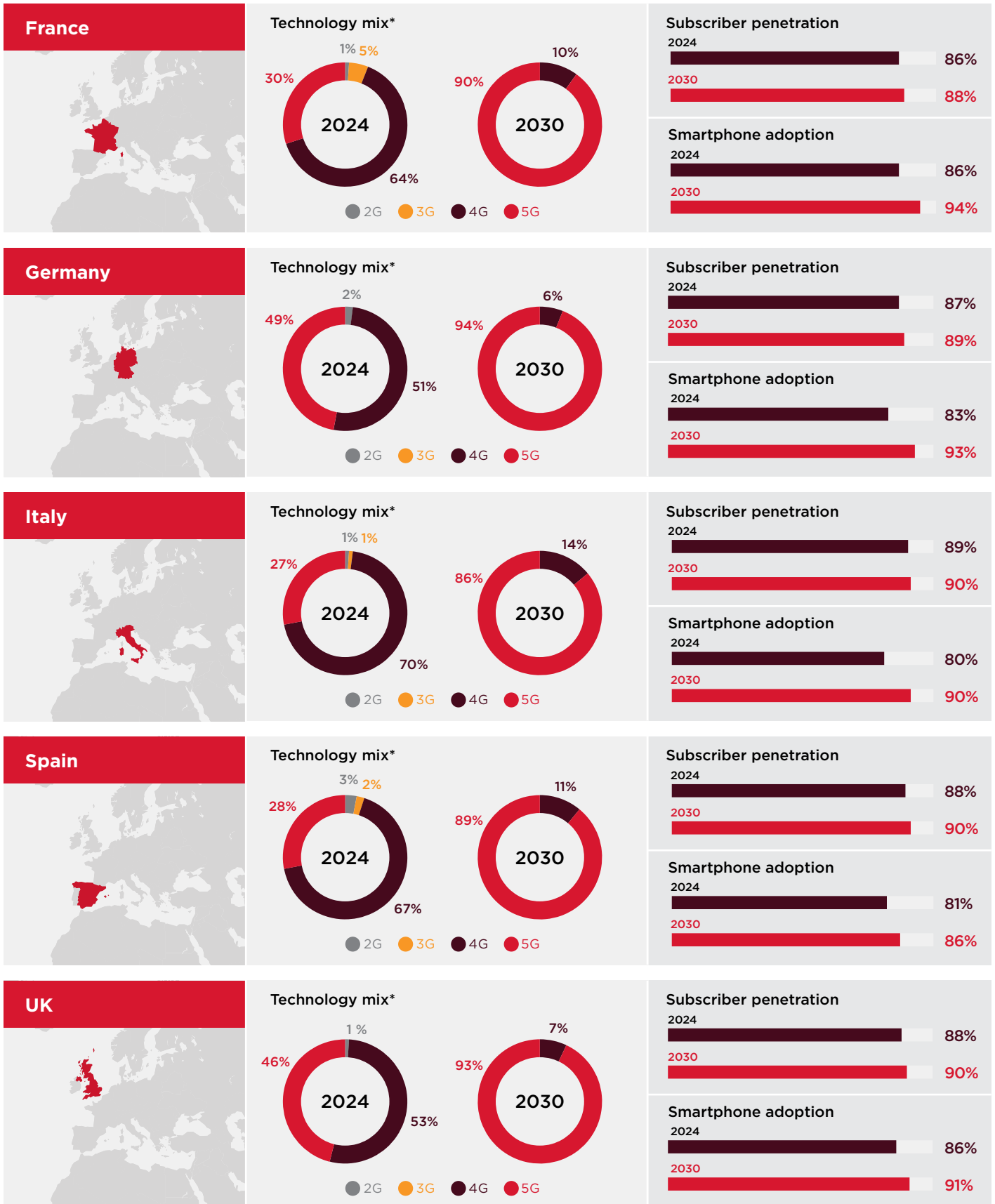
## Employment

**2023** **1.9m jobs**
Directly supported by the mobile ecosystem

**Plus 1.4m indirect jobs**

# Subscriber and technology trends for key markets

## France

**Technology mix***

2024: 2G 1%, 3G 5%, 4G 64%, 5G 30%
2030: 4G 10%, 5G 90%

Legend: ● 2G ● 3G ● 4G ● 5G

**Subscriber penetration**
2024: 86%
2030: 88%

**Smartphone adoption**
2024: 86%
2030: 94%

## Germany

**Technology mix***

2024: 2G 2%, 4G 51%, 5G 49%
2030: 4G 6%, 5G 94%

Legend: ● 2G ● 3G ● 4G ● 5G

**Subscriber penetration**
2024: 87%
2030: 89%

**Smartphone adoption**
2024: 83%
2030: 93%

## Italy

**Technology mix***

2024: 2G 1%, 3G 1%, 4G 70%, 5G 27%
2030: 4G 14%, 5G 86%

Legend: ● 2G ● 3G ● 4G ● 5G

**Subscriber penetration**
2024: 89%
2030: 90%

**Smartphone adoption**
2024: 80%
2030: 90%

## Spain

**Technology mix***

2024: 2G 3%, 3G 2%, 4G 67%, 5G 28%
2030: 4G 11%, 5G 89%

Legend: ● 2G ● 3G ● 4G ● 5G

**Subscriber penetration**
2024: 88%
2030: 90%

**Smartphone adoption**
2024: 81%
2030: 86%

## UK

**Technology mix***

2024: 2G 1%, 4G 53%, 5G 46%
2030: 4G 7%, 5G 93%

Legend: ● 2G ● 3G ● 4G ● 5G

**Subscriber penetration**
2024: 88%
2030: 90%

**Smartphone adoption**
2024: 86%
2030: 91%

\* Percentage of total connections (excluding licensed cellular IoT)
Note: Totals may not add up due to rounding.

# 01

## The mobile industry
## in numbers

# Almost 80% of Europe's population subscribe to mobile internet services

By the end of 2024, 520 million people in Europe (88% of the population) subscribed to a mobile service. Mobile internet adoption is also widespread, reaching 79% of the population, which amounts to 471 million users. This represents an increase of more than 150 million people over the past decade. Growth during this period was largely driven by the expansion of mobile broadband networks, with the coverage gap in Europe now at 1% of the population.
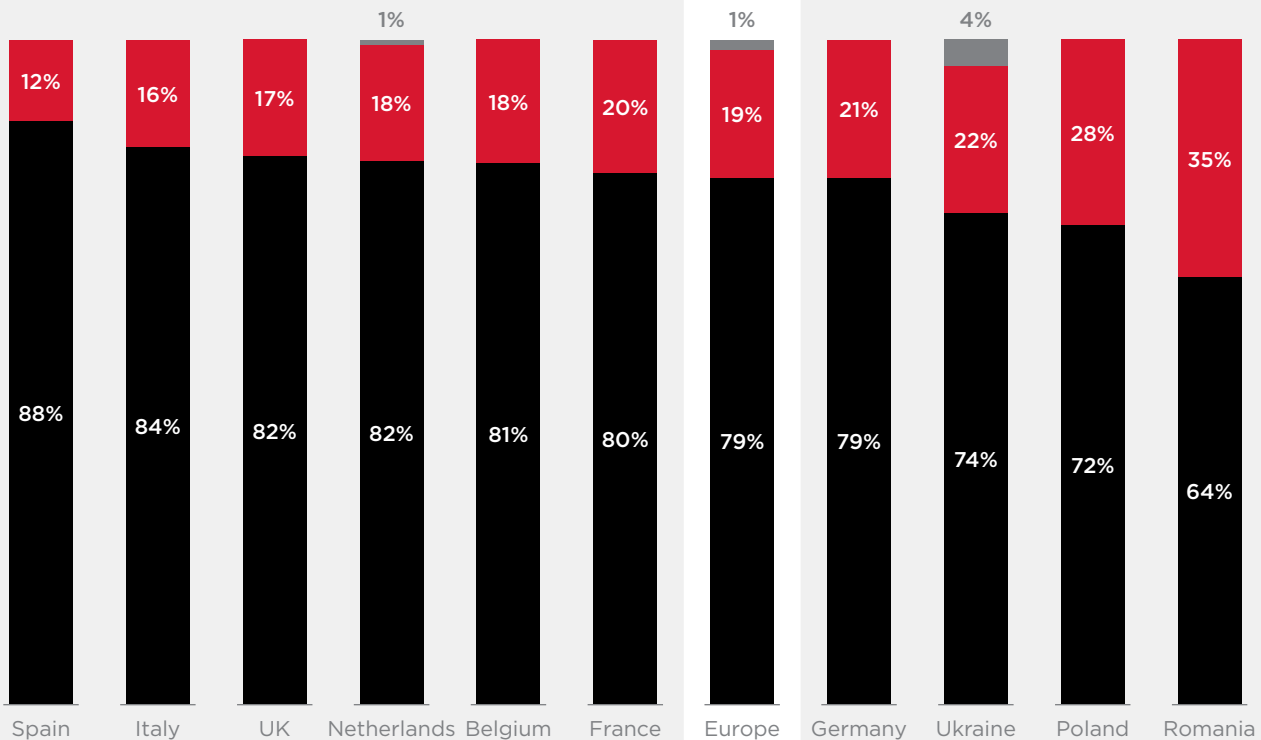
At 19%, the usage gap has also narrowed considerably over the past decade. But significant differences persist among Europe's 10 largest markets for mobile internet subscribers. In Ukraine, Poland and Romania, less than three quarters of the population have subscribed to mobile internet, compared to almost 90% in Spain.

Figure 1

## Europe: mobile internet connectivity in select markets, 2024

Percentage of population

**Coverage gap** ▬
**Usage gap** ▬
**Connected** ▬



| | Spain | Italy | UK | Netherlands | Belgium | France | Europe | Germany | Ukraine | Poland | Romania |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Coverage gap | | | | 1% | | | 1% | | 4% | | |
| Usage gap | 12% | 16% | 17% | 18% | 18% | 20% | 19% | 21% | 22% | 28% | 35% |
| Connected | 88% | 84% | 82% | 82% | 81% | 80% | 79% | 79% | 74% | 72% | 64% |

Connected: Those who use mobile internet.
Usage gap: Those who live within the footprint of a mobile broadband network but do not use mobile internet services.
Coverage gap: Those who live in an area not covered by a mobile broadband network.

Note: Totals may not add up due to rounding.
Source: GSMA Intelligence

# In 2026, 5G adoption will surpass 4G adoption in Europe

The share of mobile connections on 4G in Europe is beginning to wane as 5G adoption gathers pace. Moreover, with 2G and 3G networks already accounting for less than 10% of mobile connections in the region, legacy networks are being phased out. By the end of Q3 2024, there had been 44 network sunsets in Europe – accounting for around a third of network sunsets globally.[1]

Europe is expected to stay at the forefront in terms of migrating subscribers to newer network generations, with the region expected to account for more than half of planned network sunsets in 2025. This will give operators the opportunity to repurpose spectrum assets for more spectrally efficient 4G and 5G networks while also improving energy efficiency in the network (since legacy networks are less energy efficient).

Figure 2
## Europe: mobile adoption by technology

Percentage of total connections
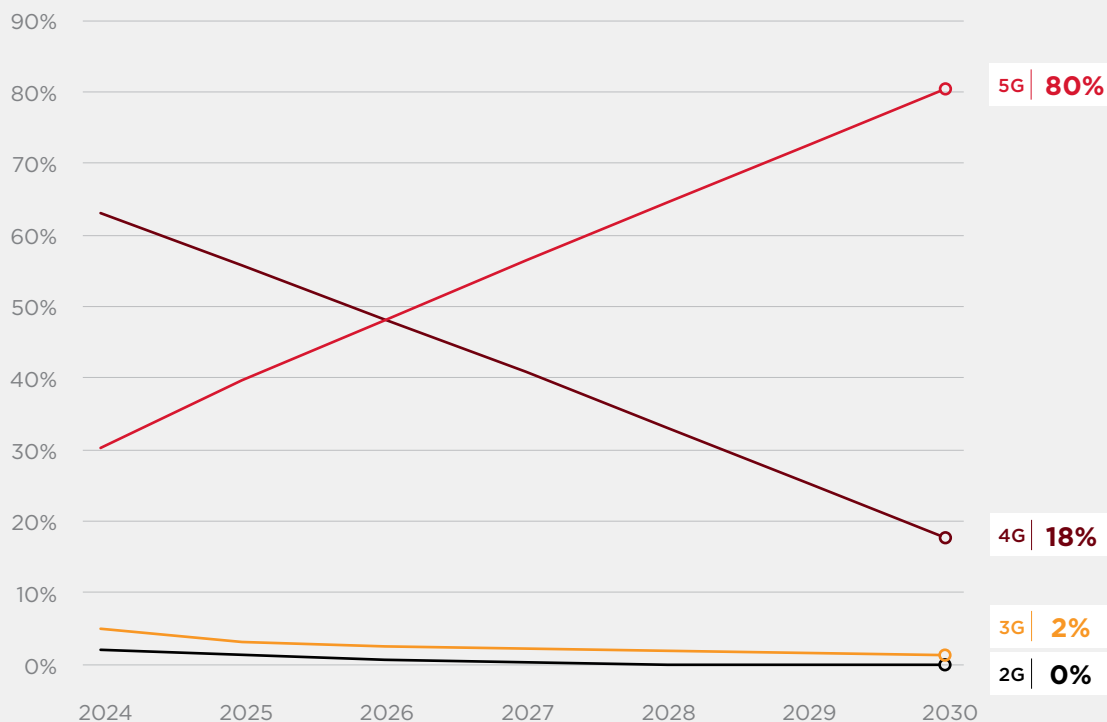


Source: GSMA Intelligence

1. <u>Network Sunsets, Q3 2024 Global trends, regional variations and outlook</u>, GSMA Intelligence, November 2024

# 5G adoption in Europe continues to lag behind other advanced regions

By the end of 2024, 5G accounted for 30% of mobile connections in Europe, equivalent to over 200 million connections. Countries such as Denmark, Finland, Germany, Norway, Switzerland and the UK have seen the fastest uptake, with 5G adoption rates exceeding 40% in each of these markets.
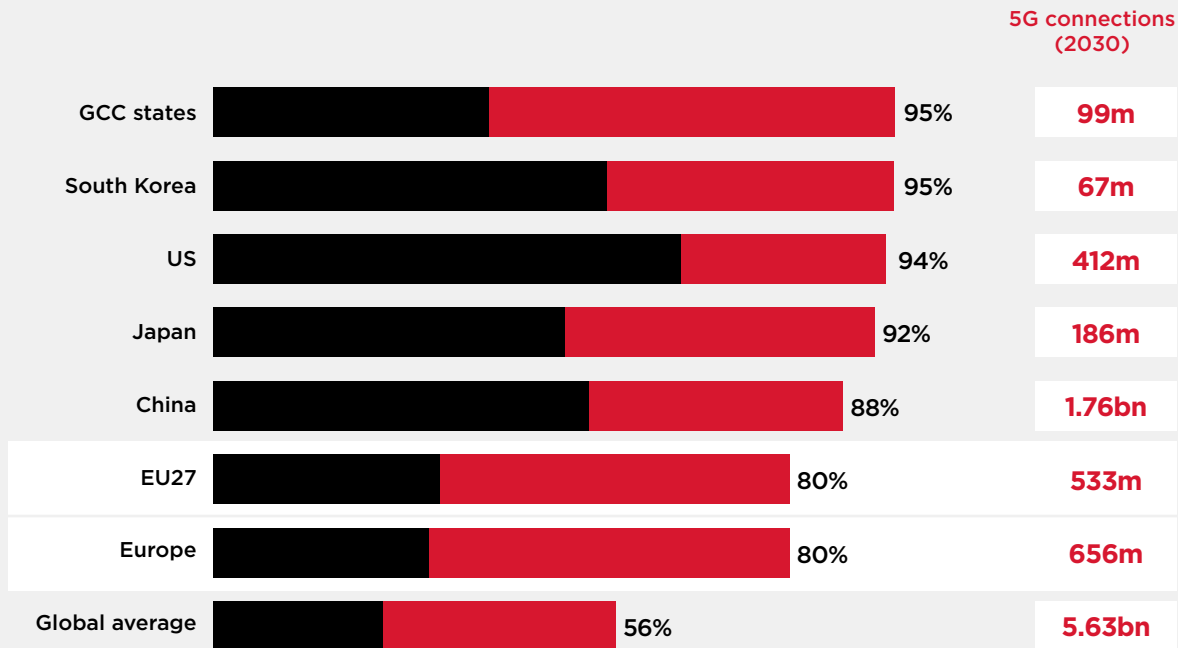
However, regions such as North America, East Asia and the Gulf Cooperation Council (GCC) states have higher levels of 5G adoption. With the first wave of 5G deployments based on Release 15 complete, many operators in these markets are shifting their attention to 5G standalone (SA) and 5G-Advanced. The adoption of these technologies in Europe will progress more slowly unless the challenges that restrict investment capacity in the European mobile sector are resolved.

Figure 3

## 5G adoption

Percentage of total connections

**2025–2030 increase** ▬
**2024** ▬



| Region | Adoption | 5G connections (2030) |
|---|---|---|
| GCC states | 95% | 99m |
| South Korea | 95% | 67m |
| US | 94% | 412m |
| Japan | 92% | 186m |
| China | 88% | 1.76bn |
| EU27 | 80% | 533m |
| Europe | 80% | 656m |
| Global average | 56% | 5.63bn |

Source: GSMA Intelligence

# Operators must invest heavily in network upgrades amid rising data traffic

Mobile data traffic has experienced massive growth globally over the past decade, driven by the increasing adoption of smartphones and growing consumption of high-bandwidth applications such as video streaming.

Between 2019 and 2024, average data traffic per mobile connection grew more than fourfold in Europe, from 3.8 GB in 2019 to 15.3 GB in 2024. Mobile data traffic will continue to rise at a significant rate through to the end of the decade, reaching almost 50 GB per mobile connection per month.
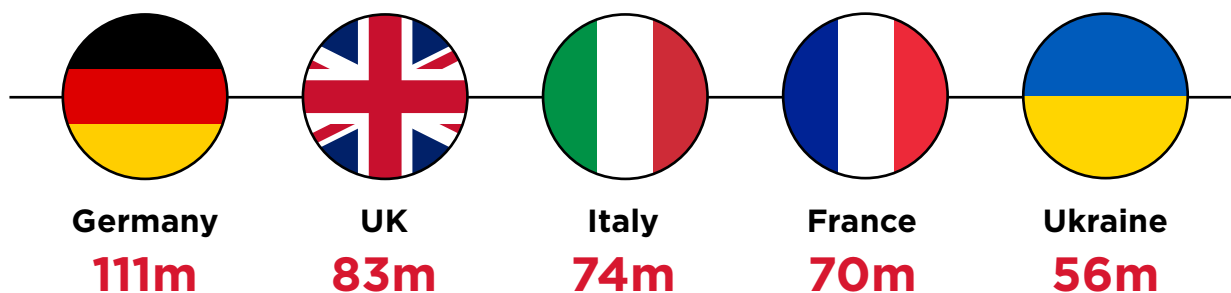
Figure 4

## Mobile data traffic per mobile connection
GB per month

| | 2024 | 2030 | Increase |
|---|---|---|---|
| US | 42 | 98 | 2.3× |
| China | 20 | 69 | 3.5× |
| Italy | 22 | 62 | 2.8× |
| Spain | 17 | 59 | 3.6× |
| France | 18 | 57 | 3.2× |
| UK | 14 | 56 | 4× |
| Germany | 13 | 55 | 4.4× |
| Europe | 15 | 49 | 3.2× |
| Global | 16 | 48 | 3× |

### Top five smartphone markets in Europe
Number of smartphone connections, 2030

| Germany | UK | Italy | France | Ukraine |
|---|---|---|---|---|
| **111m** | **83m** | **74m** | **70m** | **56m** |

Source: GSMA Intelligence

# Europe is expected to gain another 200 million licensed cellular IoT connections by 2030

By 2030, there will be almost 550 million licensed cellular IoT connections in Europe. Germany will account for around a quarter of these, while the UK, France, Italy and Sweden will each account for around 10%. To address the diverse needs of IoT use cases, operators will leverage a combination of connectivity options. This will help ensure optimised performance across different applications.

Smart utilities will be a key driver of IoT connections growth as the number of initiatives for smart metering and smart power grids continues to rise, aided by government-funded projects. There also continues to be good traction for licensed cellular IoT across Europe in other sectors, including tracking and logistics.

Figure 5

## Europe: number of licensed cellular IoT connections

Million

Rest of Europe ▬
Sweden ▬
Italy ▬
France ▬
UK ▬
Germany ▬
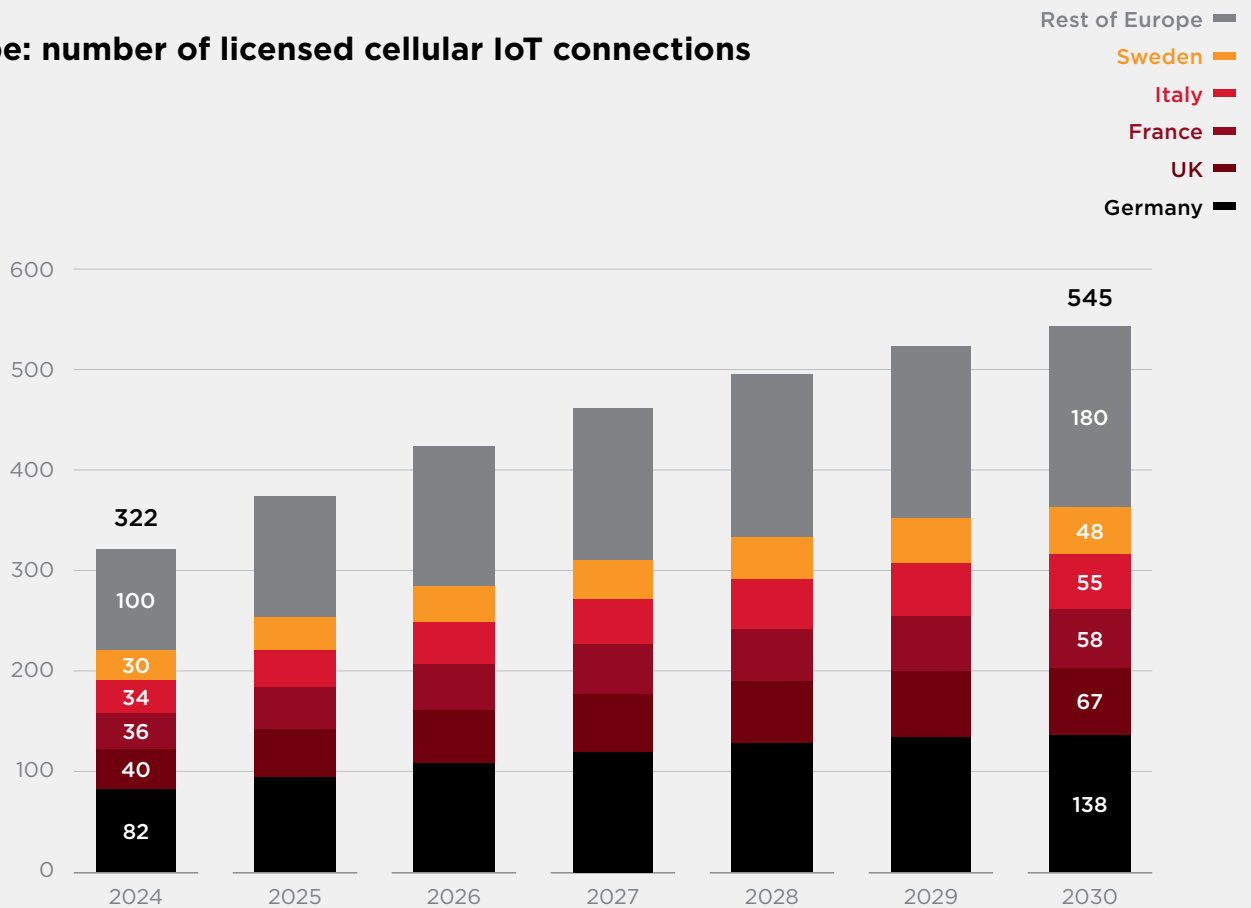


Note: Totals may not add up due to rounding.
Source: GSMA Intelligence

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# Mobile revenue growth is expected to remain in the low single digits

5G has not yet materially altered mobile revenue growth, which remains in the low single digits in percentage terms in most European markets. Consequently, there is increased pressure on operators to diversify their services and generate new revenue streams in adjacent areas. B2B remains a focus for the industry, with the launch of the next iteration of 5G networks an important underpinning for growth prospects.

On the cost side, European mobile operators have invested over €160 billion in mobile capex over the past five years, much of which has been spent on 5G networks. Mobile capex/revenue in the region was 16% at the end of 2023, likely marking the peak of the 5G investment cycle. However, mobile capex is still projected to surpass €25 billion in each year to 2030.

Figure 6

**Europe: mobile revenue and year-on-year growth**

Billion

Mobile revenue ▬
Annual growth ▬
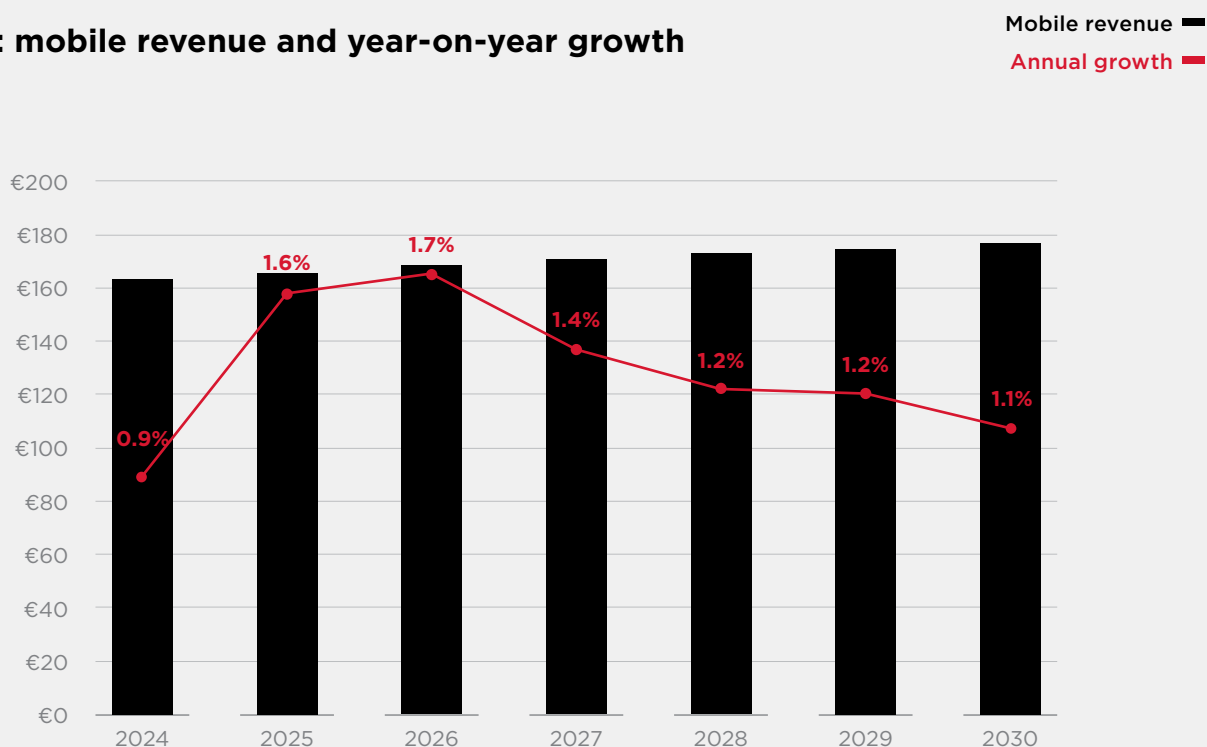


Source: GSMA Intelligence

# The mobile sector added €1.1 trillion of economic value to the European economy in 2023

In 2023, mobile technologies and services generated 5% of GDP across Europe, a contribution that amounted to almost €1.1 trillion of economic value added. The greatest benefits came from the productivity effects generated by the use of mobile services across the economy, which reached €700 billion. The direct contribution by the mobile industry ecosystem was also significant at €230 billion.

The mobile ecosystem comprises three categories: mobile operators; infrastructure and equipment providers; and content and services. The infrastructure and equipment category includes network equipment providers, device manufacturers and IoT companies. Meanwhile, the content and services category encompasses content, mobile application and service providers, distributors and retailers and mobile cloud services.

Figure 7

**Europe: total economic contribution of mobile, 2023**

Billion, percentage of GDP
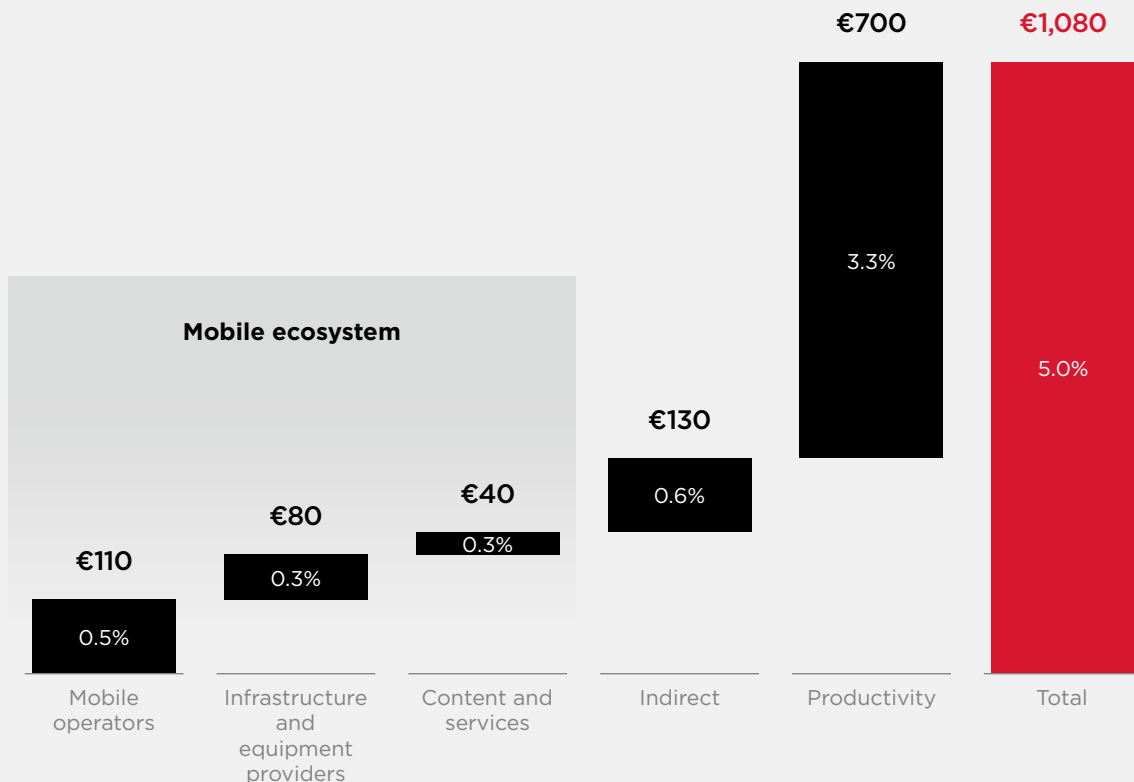


Note: Totals may not add up due to rounding.
Source: GSMA Intelligence

# By 2030, mobile's economic contribution in Europe will reach €1.2 trillion

By 2030, mobile's contribution will reach €1.2 trillion in Europe, driven mostly by the continued expansion of the mobile ecosystem and verticals increasingly benefiting from the improvements in productivity and efficiency brought about by the take-up of mobile services. This underscores the connectivity sector's role as a core enabler of Europe's digital economy.

Figure 8

**Europe: economic impact of mobile**

Billion

| | |
|---|---|
| €1,080 | €1,200 |
| 2023 | 2030 |
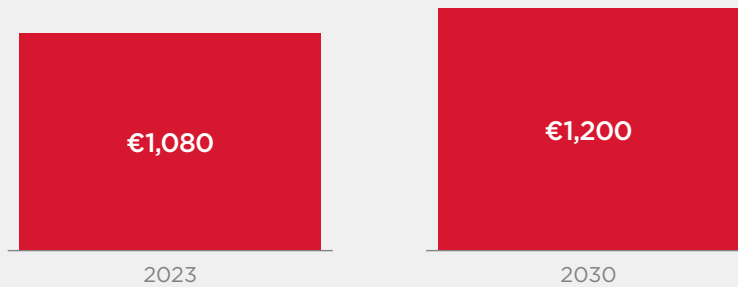
Source: GSMA Intelligence

# The mobile ecosystem in Europe supported more than 3 million jobs in 2023

Mobile operators and the wider mobile ecosystem provided direct employment to around 2 million people in Europe in 2023. In addition, economic activity in the ecosystem generated roughly 1.4 million jobs in other sectors, meaning around 3.3 million jobs in total were directly or indirectly supported.

Figure 9

**Europe: employment impact of the mobile industry, 2023**

Jobs (million)

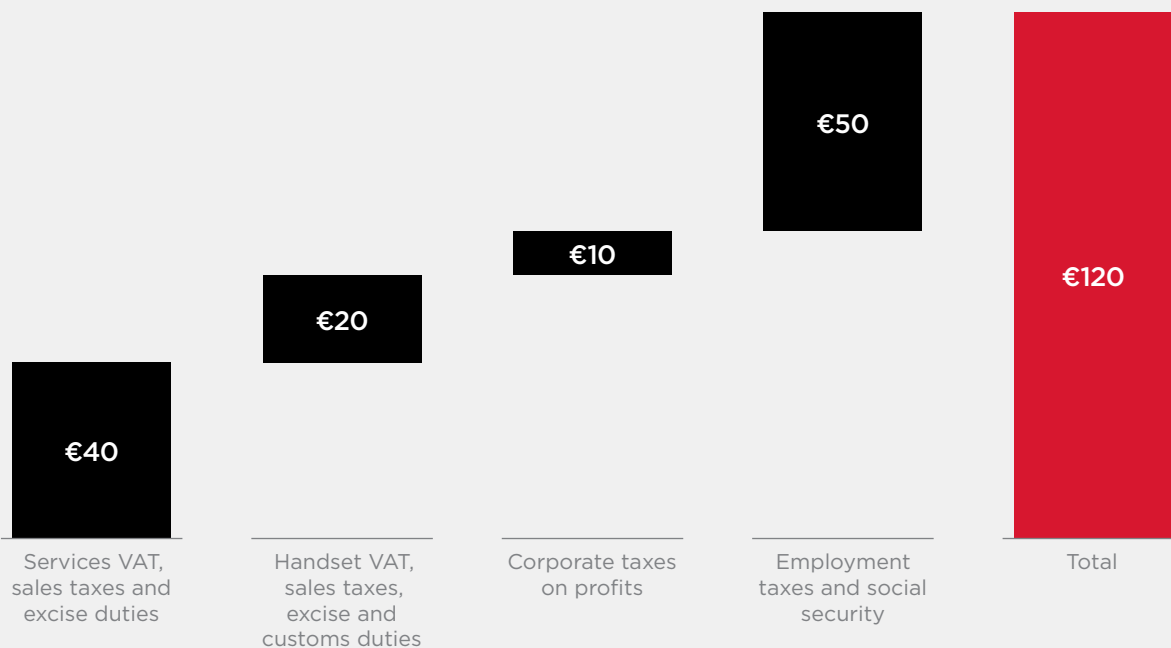| Direct | Indirect | Total |
|---|---|---|
| 1.9 | 1.4 | 3.3 |

Source: GSMA Intelligence

# The fiscal contribution of the mobile ecosystem in Europe reached €120 billion in 2023

In 2023, the mobile sector in Europe made a substantial contribution to the funding of the public sector, with €120 billion raised through taxes. The largest contribution came from employment taxes and social security, which generated €50 billion, followed by services VAT, sales taxes and excise duties at €40 billion.

Figure 10

**Europe: fiscal contribution of the mobile ecosystem, 2023**

Billion



| €40 | €20 | €10 | €50 | €120 |
|---|---|---|---|---|
| Services VAT, sales taxes and excise duties | Handset VAT, sales taxes, excise and customs duties | Corporate taxes on profits | Employment taxes and social security | Total |

Note: Totals may not add up due to rounding.
Source: GSMA Intelligence

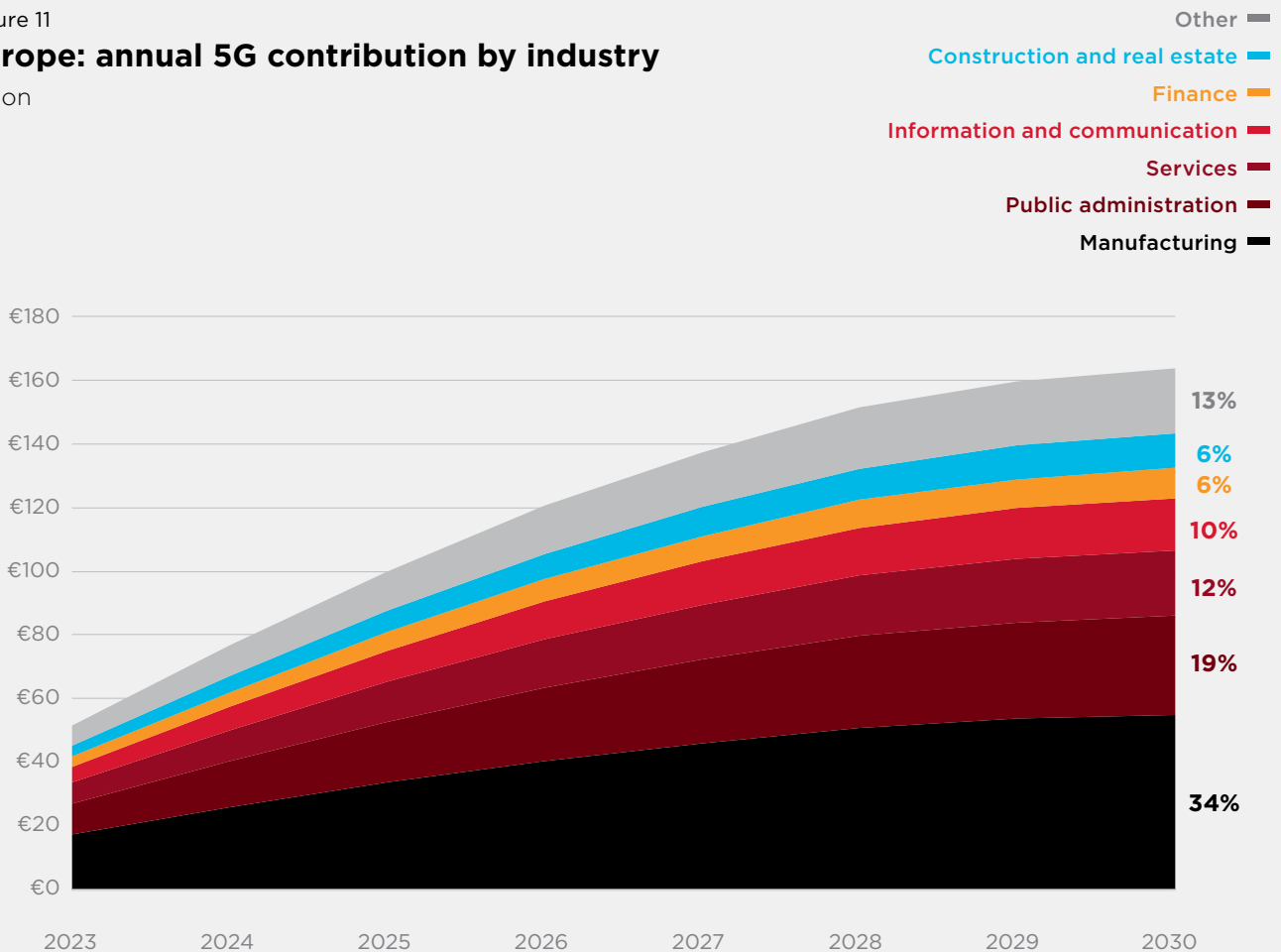# 5G will add more than €160 billion to the European economy in 2030

5G's contribution to the European economy is expected to exceed €160 billion in 2030, accounting for approximately 14% of the overall economic impact of mobile. Much of this will materialise between 2023 and 2028. Towards the end of the decade, 5G's economic benefits will level off as the technology achieves scale and adoption begins to plateau.

While 5G is expected to benefit most sectors of the European economy, some industries will benefit more than others due to their ability to incorporate 5G use cases in their business. Between 2023 and 2030, 34% of benefits are expected to originate from the manufacturing sector, driven by applications such as smart factories, smart grids and IoT-enabled products. Other sectors that will experience significant benefits are the public administration and services sectors at 19% and 12%, respectively.

Figure 11

## Europe: annual 5G contribution by industry

Billion

Other ▬
Construction and real estate ▬
Finance ▬
Information and communication ▬
Services ▬
Public administration ▬
Manufacturing ▬



13%
6%
6%
10%
12%
19%
34%

Source: GSMA Intelligence
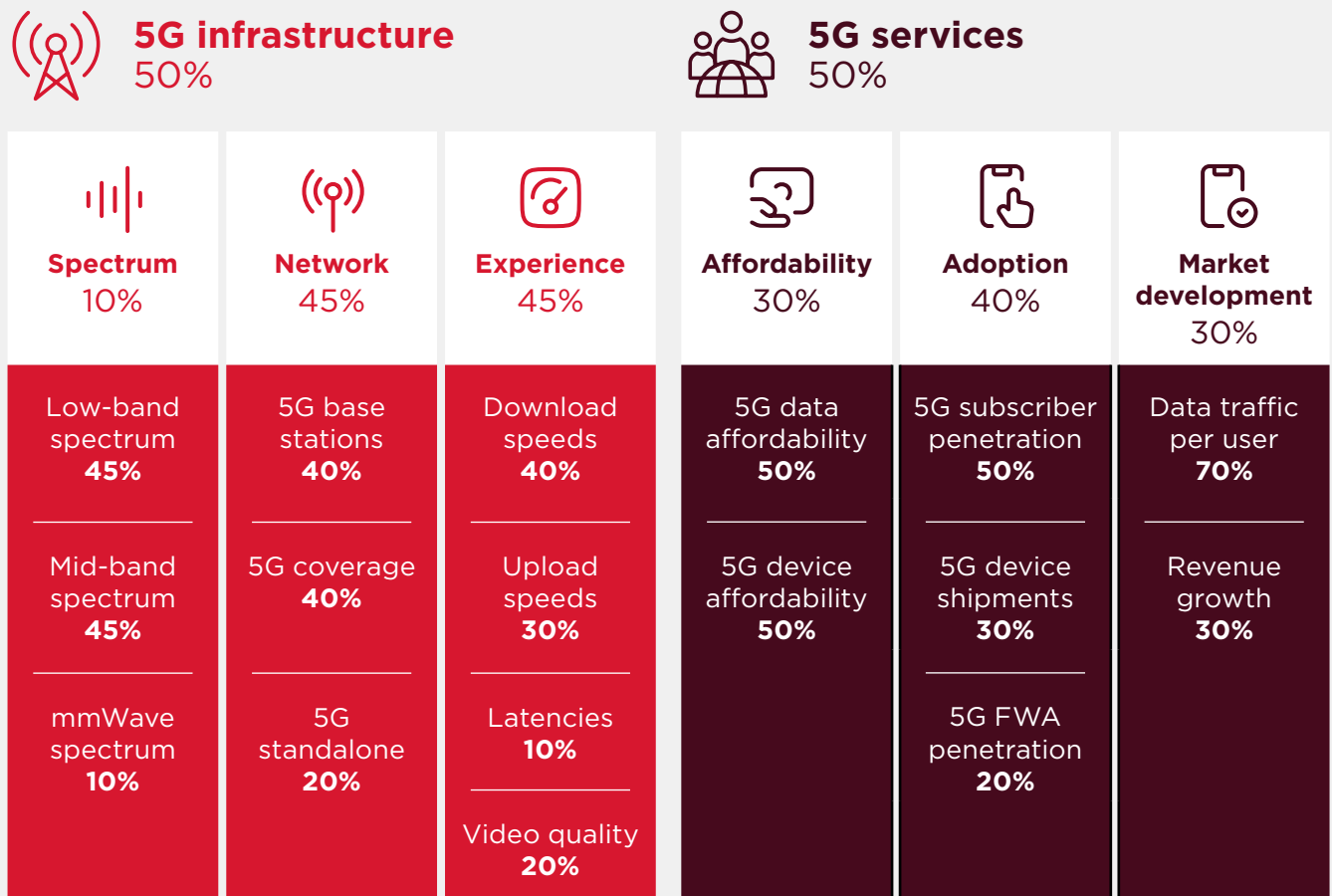
# 02

# Mobile industry trends

# 2.1
# 5G benchmarking: assessing five years of 5G

The number of 5G connections worldwide surpassed 2 billion at the end of 2024, five years after the arrival of the technology, making it the fastest-growing mobile broadband technology to date. However, despite this progress, the technology has not yet realised its full potential in terms of digital transformation, economic impact and commercial value. This highlights the imperative for strategic interventions, enabling policies and targeted investments to ensure the evolution of 5G everywhere.

Against this backdrop, GSMA Intelligence's 5G Connectivity Index (5GI) provides a comprehensive assessment of 5G in 39 markets, offering valuable insights for informed decision-making and investment by the mobile ecosystem and policymakers.[2] It is constructed around two categories, 5G infrastructure and 5G services, which are divided into six pillars, which are in turn made up of 17 indicators. In order to ensure comparability across indicators, they are normalised using the 'minimum-maximisation' method, which gives all indicators a score between 0 to 100, with a higher score always representing stronger performance.

Figure 12

**5G Connectivity Index structure and weightings: categories, pillars and indicators**

## 5G infrastructure
### 50%

| Spectrum 10% | Network 45% | Experience 45% |
|---|---|---|
| Low-band spectrum **45%** | 5G base stations **40%** | Download speeds **40%** |
| Mid-band spectrum **45%** | 5G coverage **40%** | Upload speeds **30%** |
| mmWave spectrum **10%** | 5G standalone **20%** | Latencies **10%** |
| | | Video quality **20%** |

## 5G services
### 50%

| Affordability 30% | Adoption 40% | Market development 30% |
|---|---|---|
| 5G data affordability **50%** | 5G subscriber penetration **50%** | Data traffic per user **70%** |
| 5G device affordability **50%** | 5G device shipments **30%** | Revenue growth **30%** |
| | 5G FWA penetration **20%** | |

Source: GSMA Intelligence

2. The 5G Connectivity Index webtool provides overall index scores as well as the underlying score for each indicator.

Figure 13

# 5G Connectivity Index categories, pillars and indicators

## 5G infrastructure

| Pillar | Indicator | Description | Source |
|---|---|---|---|
| **Spectrum** | Low-band spectrum | Amount of spectrum in bands below 1 GHz assigned to mobile network operators | GSMA Intelligence |
| | Mid-band spectrum | Amount of spectrum in bands in 1-7 GHz assigned to mobile network operators | GSMA Intelligence |
| | mmWave spectrum | Amount of spectrum in bands above 24 GHz assigned to mobile network operators | GSMA Intelligence |
| **Network** | 5G base stations | Number of 5G base stations deployed per 100,000 people | GSMA Intelligence |
| | 5G coverage* | Coverage and availability of 5G networks | Ookla Speedtest Intelligence® and GSMA Intelligence |
| | 5G standalone | Proportion of 5G connections with operators that have deployed a 5G standalone network | GSMA Intelligence |
| **Experience** | Download speeds | Median download speed for mobile users | Ookla Speedtest Intelligence |
| | Upload speeds | Median upload speed for mobile users | Ookla Speedtest Intelligence |
| | Latencies | Median latency for mobile users | Ookla Speedtest Intelligence |
| | Video quality | Weighted sum of multiple video quality metrics | Ookla Speedtest Intelligence |

## 5G services

| Pillar | Indicator | Description | Source |
|---|---|---|---|
| **Affordability** | 5G data affordability** | Monthly affordability of 5G data plans (based on 20 GB, 50 GB and 100 GB mobile 5G data plans) | Tarifica |
| | 5G device affordability | Monthly affordability of the cheapest available 5G device | Tarifica |
| **Adoption** | 5G subscriber penetration | 5G connections at the end of the period, expressed as a percentage share of the total population | GSMA Intelligence |
| | 5G device shipments | Proportion of new device sales that are 5G-enabled | Counterpoint Research |
| | 5G FWA penetration | 5G FWA connections as percentage of total households | GSMA Intelligence |
| **Market development** | Data traffic per user | Monthly data traffic per connection | GSMA Intelligence |
| | Revenue growth | The average percentage growth in mobile operator revenues since the launch of 5G networks in the market | GSMA Intelligence |

\* The indicators for 5G coverage entail a combination of two additional sub-indicators: 5G population coverage (representing the proportion of the population covered by a 5G network, sourced from GSMA Intelligence) and 5G availability (reflecting the proportion of users on 5G-capable devices who spend the majority of their time on 5G, sourced from Ookla Speedtest Intelligence).

\*\* The indicators for 5G data affordability entail a combination of three additional sub-indicators: monthly affordability of the cheapest 20, 50 and 100 GB mobile 5G data plan (initially expressed as a percentage of monthly GDP per capita, sourced from Tarifica).
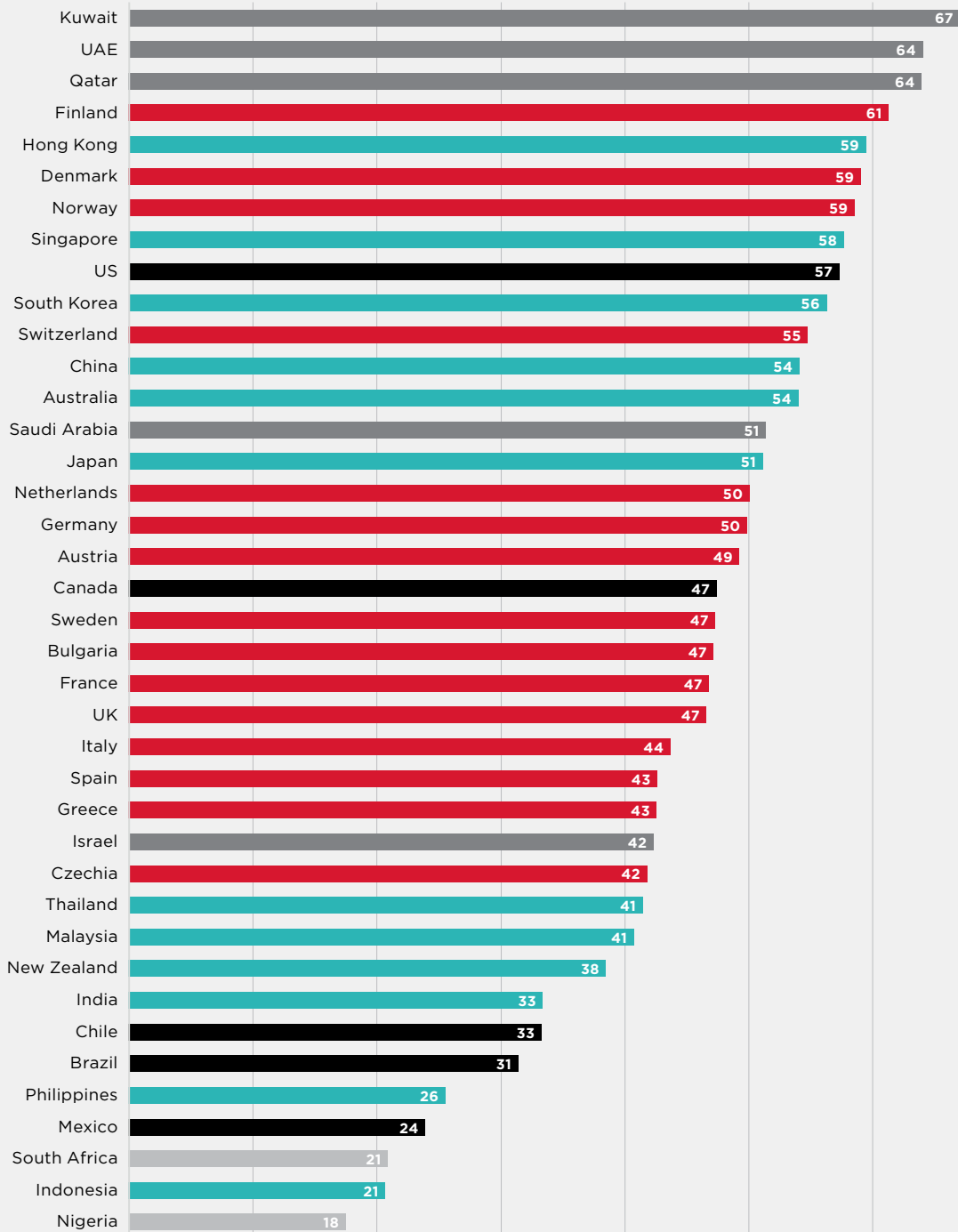
Source: GSMA Intelligence

The results of the 5GI are presented in Figure 14. Leading the way are developed economies in the Middle East, Scandinavia, Asia Pacific and North America. Most European countries included in the index have scores between 40 and 50, scoring well on spectrum and affordability but lagging behind leading markets in multiple indicators across the network, experience, adoption and market development pillars.

Figure 14

## 5G Connectivity Index results by market, Q3 2024

Scores out of 100

Americas ▬
Asia Pacific ▬
Europe ▬
Middle East ▬
Sub-Saharan Africa ▬

| Market | Score |
|---|---|
| Kuwait | 67 |
| UAE | 64 |
| Qatar | 64 |
| Finland | 61 |
| Hong Kong | 59 |
| Denmark | 59 |
| Norway | 59 |
| Singapore | 58 |
| US | 57 |
| South Korea | 56 |
| Switzerland | 55 |
| China | 54 |
| Australia | 54 |
| Saudi Arabia | 51 |
| Japan | 51 |
| Netherlands | 50 |
| Germany | 50 |
| Austria | 49 |
| Canada | 47 |
| Sweden | 47 |
| Bulgaria | 47 |
| France | 47 |
| UK | 47 |
| Italy | 44 |
| Spain | 43 |
| Greece | 43 |
| Israel | 42 |
| Czechia | 42 |
| Thailand | 41 |
| Malaysia | 41 |
| New Zealand | 38 |
| India | 33 |
| Chile | 33 |
| Brazil | 31 |
| Philippines | 26 |
| Mexico | 24 |
| South Africa | 21 |
| Indonesia | 21 |
| Nigeria | 18 |

Source: GSMA Intelligence

# Europe lags behind in the network and experience pillars

Europe's score on the network pillar highlights the need to accelerate the deployment of 5G base stations (with 11 of the 15 European countries included in the 5GI scoring lower than 30 on this indicator).[3] Europe fares better on coverage: 24 European countries reported over 90% 5G population coverage by the end of 2024. A combination of low- and mid-band spectrum has been deployed by operators to accomplish this. Extending the deployment of mid-band spectrum, particularly in the 3.5 GHz range, is vital for delivering the network performance necessary for advanced applications.

5G SA is another area where performance in Europe falls short compared to other advanced regions. At the end of Q3 2024, only around 15% of operators in Europe with live 5G networks had launched 5G SA, compared to over 30% in Asia Pacific and North America. This is indicative of the difficult operating conditions facing European operators. Recent 5G SA launches by EE in the UK and Free in France suggest 5G SA deployments are gathering pace, but the speed of rollouts remains slower than many industry players anticipated a few years ago.

Figure 15

## 5G Connectivity Index: network, Q3 2024

Scores out of 100

■ 5G base stations
■ 5G coverage
■ 5G SA
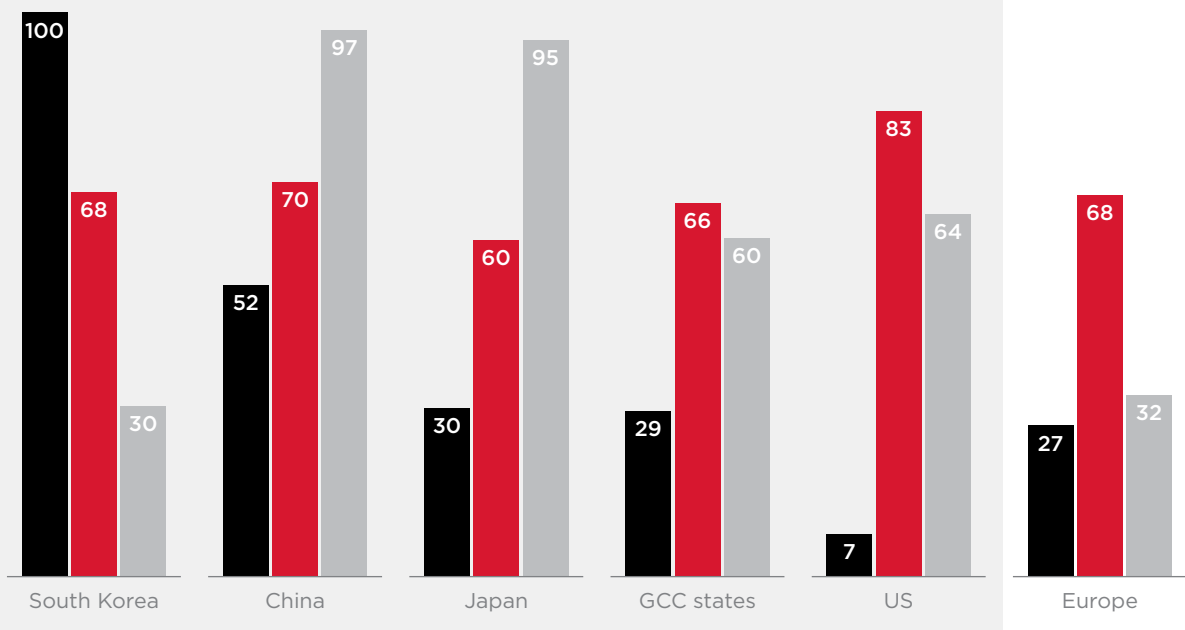


Note: The scores for the GCC states and Europe reflect an average of the countries from these regions included in the 5GI, not all countries.
Source: GSMA Intelligence

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3.  The network pillar consists of 5G base stations, 5G coverage and 5G standalone. See Figure 13 for more details.

In all of the markets included in the first edition of the 5GI, the consumer experience on 5G networks is noticeably outperforming that of 4G networks. By the end of 2023, average 5G download speeds had reached approximately 230 Mbps, a more than fivefold increase from the 44 Mbps of 4G sp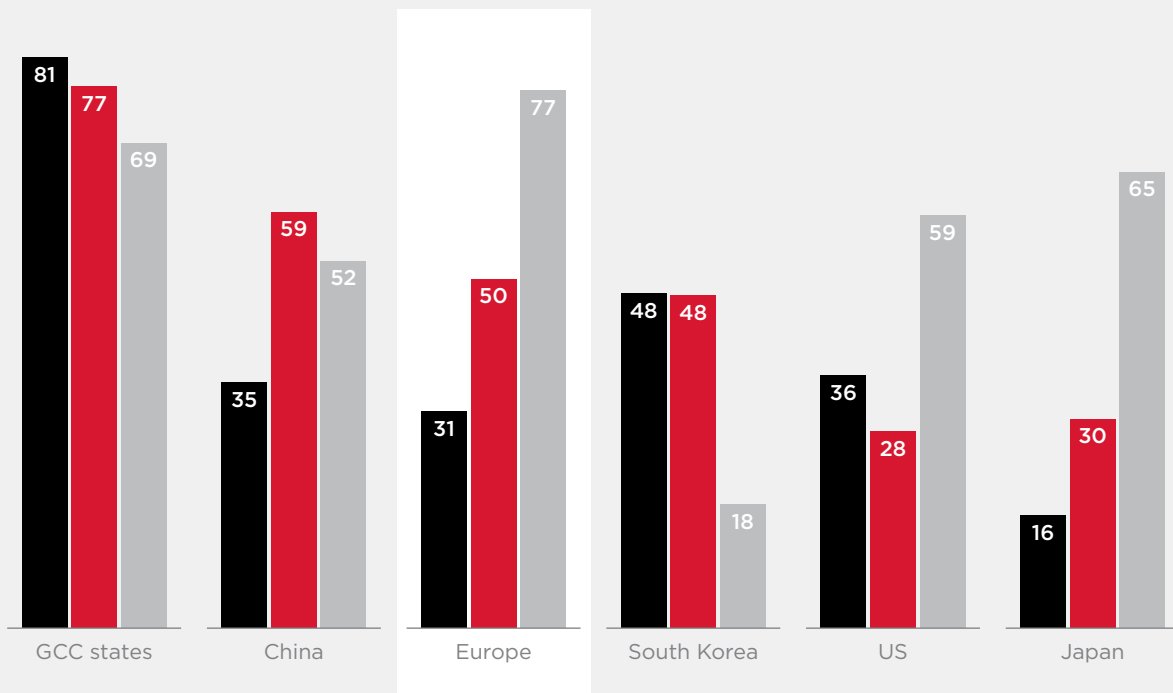eeds. European countries included in the 5GI typically perform better in the 5G experience pillar than in the 5G network pillar. However, they still need to improve their performance to reach the levels seen in leading markets within the GCC states and in developed Asia Pacific, particularly with regard to download speeds.

Figure 16
**5G Connectivity Index: experience, Q3 2024**
Scores out of 100

Download speeds ▬
Upload speeds ▬
Latencies ▬



Note: The scores for GCC states and Europe reflect an average of the countries from these regions included in the 5GI, not all countries.
Source: GSMA Intelligence

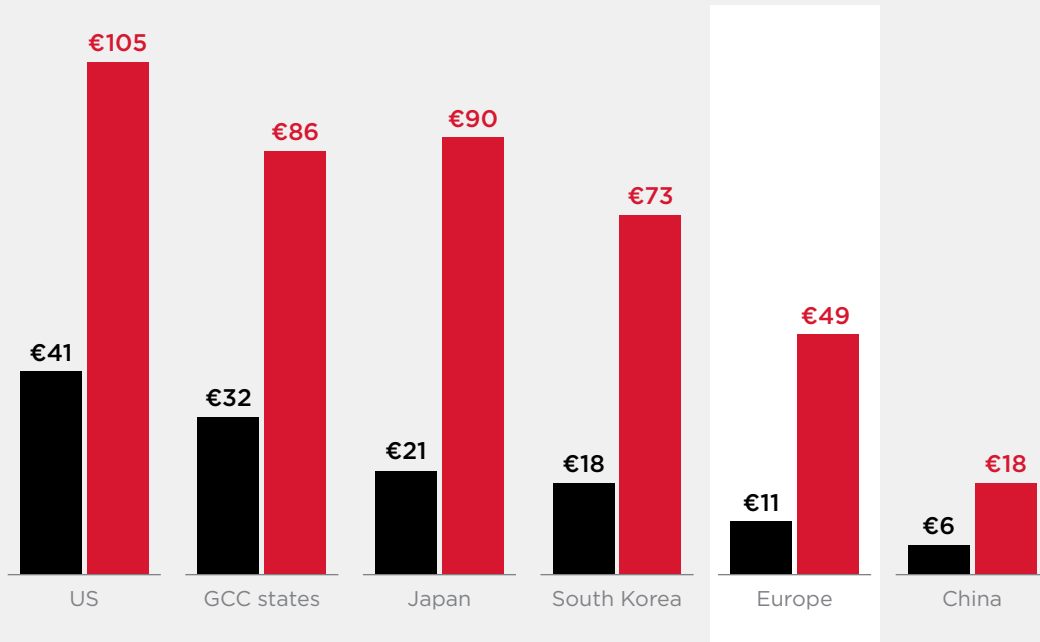# European operators face a tough financial outlook

In the 5G services category of the 5GI, Europe performs well on affordability but falls behind on the adoption and market development pillars. North America, East Asia and the GCC states lead on 5G adoption (see Figure 3), with only six markets in Europe surpassing the 40% mark at the end of 2024. In the market development pillar, Europe trails on advancements in the data traffic per user and revenue growth indicators, which are crucial for establishing a solid business case for the next phase of 5G.

Figure 17 highlights the difficulties faced by European operators as they enter the next phase of the 5G era. The highly competitive mobile market has restricted prospects for revenue growth, leaving mobile ARPUs significantly lower than those in other advanced regions. This constrains the ability of operators in the region to invest, with Europe's revenue weakness mirrored by lower mobile capex per capita. These financial challenges underscore the need for strong policy actions to drive a turnaround in Europe (as detailed in Chapter 4).

Figure 17

## Mobile ARPU and mobile capex per capita, 2024

Monthly ARPU, by mobile connection ▬
Mobile capex per capita ▬

| | US | GCC states | Japan | South Korea | Europe | China |
|---|---|---|---|---|---|---|
| Monthly ARPU | €41 | €32 | €21 | €18 | €11 | €6 |
| Mobile capex per capita | €105 | €86 | €90 | €73 | €49 | €18 |

Source: GSMA Intelligence

## 2.2
# 5G's next wave: focus shifts to 5G-Advanced and 5G RedCap

5G technology is now available in more than 100 countries around the world. GSMA Intelligence data shows that the number of 5G connections surpassed 2 billion globally at the end of 2024, equivalent to nearly a quarter of total mobile connections. 5G has reached mass-market levels in several pioneering countries, accounting for more than half of mobile connections. These include Germany and Switzerland in Europe, as well as China, South Korea and the US.

5G fixed wireless access (FWA) has emerged as an important use case in the consumer and enterprise segments, complementing operators' enhanced mobile broadband (eMBB) offerings. To date, operators in 24 countries across Europe have launched 5G FWA services, while 5G FWA household adoption is expected to reach double-digit figures in percentage terms in several European countries by 2030, including Austria, Bulgaria and Switzerland.

Targeted use cases of 5G FWA services to enterprises include providing point of primary connectivity for selected applications (e.g. mobile payments), providing connectivity for temporary sites (e.g. pop-up stores or construction zones) and back-up connectivity in case of failure of the primary fixed broadband connection. 5G FWA is particularly needed in areas where businesses have little choice of providers or where fibre connections may not be cost effective.

# Advanced 5G technologies gain traction

Operators in Europe are increasingly shifting their focus to more advanced forms of 5G to unlock new use cases and monetisation opportunities. In particular, operators have begun deploying 5G networks based on the SA architecture, which offers several capabilities, including network slicing – the flexibility of allocating network resources dynamically to specific service-level agreements. 5G SA networks will be pivotal to fully realising the capabilities of 5G technology.

In 2024, there was a flurry of 5G SA launches in leading markets across Europe, with the number of live 5G SA networks reaching 18 by the end of September 2024. For example, Deutsche Telekom launched its 5G SA network in tandem with its new 5G+ Gaming option that is based on network slicing. The operator has opted to offer market-specific 5G SA–based use cases to its subscribers as opposed to a general 5G SA network launch. In September, French operator Free launched its 5G SA service,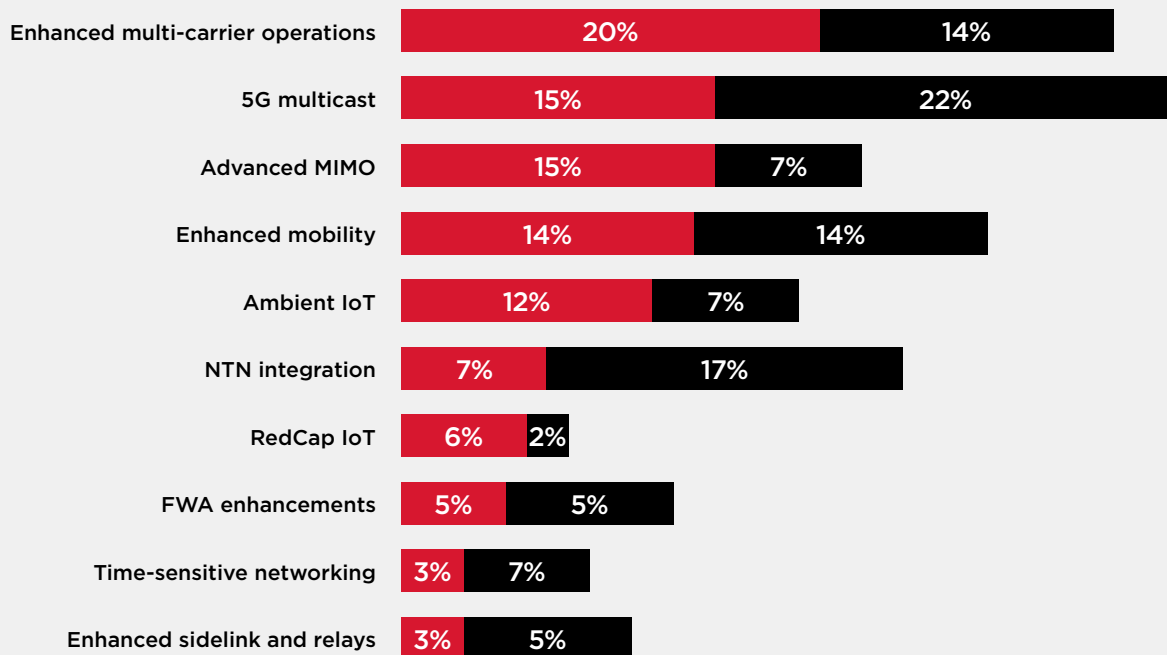 offering the service to customers with compatible devices at no extra cost. In November, Virgin Media O2 deployed 5G SA small cells in Birmingham city centre in the UK, with initial performance data showing a better mobile internet experience for customers.

Beyond the deployment of 5G SA networks, operators in Europe are looking to leverage 5G-Advanced and 5G reduced capability (RedCap) technologies to deliver new solutions for enterprises. 5G-Advanced, as part of 3GPP Release 18 in 2024, is the next milestone in the 5G era and is set to enhance mobility by enabling uplink and multicast at better latency, increase accuracy for extended reality (XR) applications and improve the reliability of AI/machine-learning (ML) data-driven designs. In the GSMA Intelligence Network Transformation Survey 2024, operators globally most commonly pointed to improved carrier aggregation to deliver higher peak speeds as a main 5G-Advanced feature.

Figure 18

## 5G-Advanced: priority use cases

Which 5G-Advanced use cases and applications are most important to your network transformation priorities? (Top two choices)
Percentage of operators (globally)

Rank 1
Rank 2

| Use case | Rank 1 | Rank 2 |
|---|---|---|
| Enhanced multi-carrier operations | 20% | 14% |
| 5G multicast | 15% | 22% |
| Advanced MIMO | 15% | 7% |
| Enhanced mobility | 14% | 14% |
| Ambient IoT | 12% | 7% |
| NTN integration | 7% | 17% |
| RedCap IoT | 6% | 2% |
| FWA enhancements | 5% | 5% |
| Time-sensitive networking | 3% | 7% |
| Enhanced sidelink and relays | 3% | 5% |

Source: GSMA Intelligence Operators in Focus: Network Transformation Survey 2024

Meanwhile, 3GPP Release 17 introduced the RedCap user equipment category for energy- and cost-efficient 5G IoT connectivity (also known as 5G NR-Light). In comparison to 5G eMBB devices that can deliver gigabits per second throughput in both the downlink and uplink, RedCap devices efficiently support 150 Mbps and 50 Mbps in the downlink and uplink, respectively. The reduced complexity of RedCap devices contributes to cost-efficiency, a smaller device footprint and longer battery life due to lower power consumption.

5G RedCap is an important enabler for mid-tier cellular IoT applications; it serves as a platform for the successful migration of IoT applications to 5G networks in order to take advantage of the benefits of 5G beyond just speed. A range of use cases will benefit from RedCap, notably wearables, video monitoring and telematics. For example, most wearables support medium data rates in small form factors with relatively low power consumption, which is not achievable with eMBB or massive machine-type communications (mMTC). Also, many video applications for surveillance don't require the eMBB's high data rates and so can benefit from the lower power consumption achievable with 5G RedCap.

Below are recent examples of 5G-Advanced and 5G RedCap activities in Europe:

- **O2 Telefónica Germany** is working with Nokia to harness 5G-Advanced and 5G SA networks to decouple legacy technologies and processes while providing a framework for exposing network APIs to application developers.

- **Orange** has assessed some key 5G-Advanced technologies, including a 6 GHz test and passive IoT verification. The operator expects 5G-Advanced services to improve network energy efficiency to lower power consumption, and enable use cases around end-to-end slicing for cloud gaming and a next-generation, real-time communication service.

- **Vodafone**, along with Ericsson and Qualcomm, has demonstrated the first RAN RedCap data sessions on a European network. The operator expects this to pave the way for IoT and other connected devices to transmit data more simply and efficiently.

- **BT Group** has collaborated with Nokia and MediaTek to complete trials of 5G RedCap, highlighting the opportunity to enable new 5G use cases for many industries, with potentially billions of new devices connected with 5G.

The growing focus on 5G-Advanced and 5G RedCap will kick-start a new round of 5G investments in and lay the foundation for the next wave of 5G use cases that could unlock new revenue streams for operators and the wider ecosystem in both the consumer and enterprise segments. More than half of operators globally in the GSMA Intelligence Network Transformation Survey 2024 said they plan to deploy 5G-Advanced in the near term.

# 5G RedCap is an important enabler for mid-tier cellular IoT applications

# 2.3
# Open Gateway: capturing the opportunities ahead

While it has long been possible to expose network APIs, operators have struggled to adopt a standardised approach that unlocks innovation at a global scale. This is the driving force behind the GSMA Open Gateway, which helps developers and cloud providers enhance and deploy services more quickly via single points of access to operator networks.

The GSMA Open Gateway is achieved via common, northbound service APIs that expose mobile operators' network capabilities within a consistent, interoperable and federated framework.

The APIs are defined, developed and published in CAMARA, the open-source project for developers to access enhanced network capabilities, driven by the Linux Foundation in collaboration with the GSMA.

The GSMA Open Gateway comprises a library of over 20 APIs. These are split into different families based on the use case being addressed.[4] The APIs have the potential to facilitate numerous use cases, including tackling digital fraud, simplifying user authentication and addressing quality-of-service (QoS) issues.

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4.   API families include anti-fraud, mobile connectivity and value-added services, fixed connectivity, cloud and edge, and payments.

# GSMA Open Gateway gathers steam

As of December 2024, 67 operator groups had signed up to the GSMA Open Gateway initiative, accounting for 75% of mobile connections globally. BT, CK Hutchison, Deutsche Telekom, KPN, Liberty Global, MasMovil, Orange, Swisscom, Telefónica, Telenor, TIM, Veon and Vodafone are among the operators in Europe to have signed up to the initiative. This shows a clear intent to establish the supply side of the API equation.

The geographic breakdown of operator commitments indicates whether a region is above or below its established market share. Europe is a leading region, with committed operators representing more than 20% of GSMA Open Gateway commitments despite accounting for around only 10% of mobile connections.

Many of the early API launches in Europe have focused on fraud prevention and security, using SIM Swap and Number Verification. These represent easy wins, given the ever-present risks from fraudsters and breaches for operators and their customers. Other parts of the API library (e.g. Quality on Demand) are also being assessed as operators expand their rollouts of 5G SA and other enabling technologies. Examples of commercial deployments include the following:

- **Deutsche Telekom's '5G Live Video Production':** The 5G Live Video Production solution leverages Deutsche Telekom's 5G SA and network slicing capabilities, along with the Quality on Demand API, to ensure stable broadcasting for live events. As a result, TV teams can transmit their live HD videos streams reliably, even without a satellite connection. RTL Deutschland is one of the companies using the solution for live broadcasting. It began testing with Deutsche Telekom in 2022, before the two companies formed a full production partnership for the 2024 UEFA European Football Championship.

- **Vodafone UK's 'Scam Signal':** The Scam Signal API enables financial institutions to swiftly identify and thwart fraudulent bank transfers as they occur in real time. Leveraging advanced analyses of real-time network data during live transactions, it effectively detects and mitigates social engineering attempts aimed at deceiving and defrauding account holders. This builds on Vodafone's launch of the GSMA Open Gateway SIM Swap and Number Verification API to improve online verification and security.

These two solutions illustrate the potential of network APIs to solve real-world problems. However, APIs that function only on a single network offer less benefit to developers compared to APIs that are available across multiple networks. This is why operators in several countries have attempted to coordinate the rollout of several GSMA Open Gateway APIs.

In Spain, for example, Orange, Telefónica and Vodafone have launched the SIM Swap and Number Verification APIs. Second-hand fashion e-commerce retailer Vinted is among the early adopters to have integrated the GSMA Open Gateway Number Verification API into its security framework. This enhances Vinted's authentication protocols and streamlines its identification process.

# Scaling up the network API opportunity

2025 will bring more operator commitments and further commercial launches in Europe. Concrete examples of how federation and agreement on common APIs can drive success will be key to drive usage. This will require operators to focus on the developer experience, dedicating internal resources to work directly with developers while building partnerships with API aggregators that can help operators reach a broader set of developers.

In this regard, the announcement in September 2024 that Ericsson and some of the world's largest operators have created a joint venture (JV) to combine and sell network APIs to the global developer community is significant. Deutsche Telekom, Orange, Telefónica and Vodafone are among the European operators to have joined the JV, with other operators able to join on the same terms as existing JV members.

The formation of this new JV signals the commitment of leading players in the industry to scale up the network API opportunity. It should help to accelerate the rate at which network APIs become accessible across multiple networks, while also simplifying commercial agreements between developers and operators. Nonetheless, the aggregator landscape is diverse and operators are likely to rely on partnerships with a range of infrastructure players, hyperscalers and communications-platform-as-a-service (CPaaS) providers to maximise the reach of their network APIs.

# 2.4
# Generative AI: driving transformation and building partnerships

AI, including generative AI (genAI), is gaining traction globally and operators in Europe are at the forefront of this development, with increased investment in these technologies to pilot innovative use cases and expand deployments. As AI adoption grows in the region, much of the industry's work is focusing on optimising networks, enhancing security and improving customer services.[5] Examples of this include the following:

- **Orange adds network AI to its operation centre:** In April 2024, Orange incorporated Augtera's AI and ML network operations platform into its network operations centre to enhance network reliability and efficiency. This integration was expected to be completed by the end of 2024 and is following a two-year trial across Orange's global networks. It aims to reduce daily alarm alerts by 70% through AI-driven anomaly detections and auto-correlation of network data. With Augtera's predictive capabilities, the operator can proactively address network incidents before customers experience service impacts. This integration enables operations teams to prioritise significant alerts, enhancing their responsiveness and the customer experience across a network that spans over 100 countries.

- **EE improves network reliability with AI:** EE launched its 5G SA network across 15 cities in the UK in September 2024. The 5G SA network leverages ML for network efficiency, putting inactive mobile cells to sleep to save energy. The network uses AI to improve reliability with the 'Network Boost' feature to enhance performance in busy areas.

- **Vodafone supports customer services with chatbot:** Early in 2024, Voxi by Vodafone launched a telecoms-specific genAI chatbot in the UK, powered by OpenAI's ChatGPT and developed in collaboration with Accenture. It has initially served a limited customer base to address any early-stage issues, with plans for broader deployment. The chatbot aims to deliver a more interactive, human-like support experience, marking Voxi's commitment to integrating genAI into customer service for greater efficiency and engagement. This move aligns with Vodafone's recent 10-year strategic partnership with Microsoft, focused on enhancing customer service and digital transformation through AI.

- **Deutsche Telekom leverages AI to bolster security defences:** Every day, Deutsche Telekom's cyber-defence team analyses around 1 billion pieces of security-relevant data for signs of cyberattacks. This process is fully automated with the assistance of AI, which can recognise patterns and deviations, indicating attacks more quickly and efficiently. Deutsche Telekom has developed and trained the AI itself, in cooperation with Telekom Innovation Laboratories. The operator has been using AI for over two years now to protect the security of its own infrastructure and its customers.
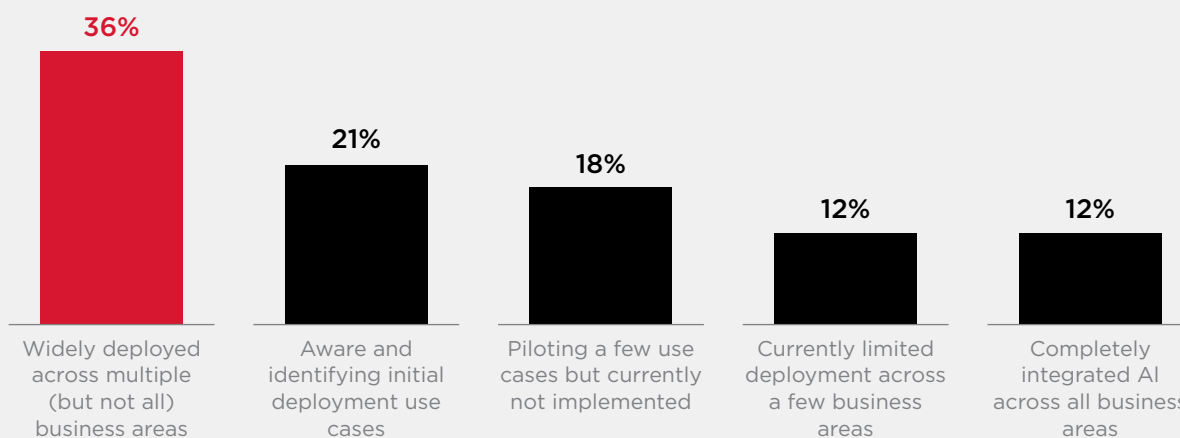
Beyond network deployments, operators also recognise that maximising AI's potential will require new network capabilities i.e. networks for AI. For example, edge computing for AI inferencing is considered a promising 5G monetisation opportunity, albeit one that necessitates investment in edge assets and management capabilities.

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5. GSMA Intelligence AI Adoption Survey 2024

## More than a third of operators surveyed in Europe claim to have deployed genAI across multiple business areas

Percentage of operators



| Widely deployed across multiple (but not all) business areas | Aware and identifying initial deployment use cases | Piloting a few use cases but currently not implemented | Currently limited deployment across a few business areas | Completely integrated AI across all business areas |
| --- | --- | --- | --- | --- |
| 36% | 21% | 18% | 12% | 12% |

Source: GSMA Intelligence AI Adoption Survey 2024

## Partnerships driving innovations

Operators in Europe are increasingly forming regional and global partnerships to strengthen their genAI capabilities. For instance, Telefónica partnered with Matsuko and Nvidia to launch a holographic meeting experience at MWC 2024. The operator also partnered with Microsoft to integrate Azure AI Studio in its Kernel platform to streamline genAI workflows. Separately, Deutsche Telekom, which is part of the Global Telco AI Alliance, is collaborating with multinational partners to enhance telecoms-specific LLM technology.

Such partnerships are key to enhancing operators' AI capabilities and paving the way for new business models and revenue streams. However, challenges remain, particularly around cloud and computing capacity and funding. There is also a shortage of skilled AI professionals, particularly in areas such as data engineering and advanced AI model development. To support AI adoption and skills for the telecoms sector, the GSMA and IBM have jointly launched the GSMA Advance AI Training programme and the GSMA Foundry Generative AI challenge and programme, furthering genAI progress across the telecoms industry.

## Making the most of AI responsibly

The mobile industry is committed to the ethical use of AI in its operations and customer interactions to protect customers and employees, remove any entrenched inequality and ensure that AI operates reliably and fairly for all stakeholders. As AI adoption accelerates, organisations and governments are evaluating how best to leverage this technology for the welfare of people and the planet. For instance, the EU's AI Act regulates the ethical use of AI and has set a framework for operators to develop AI applications responsibly.

Recognising the need for ethical standards, the GSMA has collaborated with operators and AI experts to create the GSMA Responsible AI Maturity Roadmap,[6] an actionable framework designed to help operators assess and improve AI practices responsibly. Increased collaboration between policymakers can also help private-sector organisations establish appropriate AI guidelines. To support this outcome, the EU AI Office and the US AI Safety Institute announced they will work together on tools to evaluate AI models.

6.  The GSMA Responsible AI Maturity Roadmap

# 2.5
# Satellites and NTNs: momentum builds behind aerial connectivity

Terrestrial networks remain the primary form of connectivity, supported by the wide area coverage of wireless networks and the mass production and adoption of mobile devices. In recent years, however, technological advances in various satellite and other non-terrestrial networks (NTNs) have helped to overcome several limitations associated with aerial connectivity. This has resulted in significant performance improvements, lower deployment costs and more commercially viable business models for satellite and NTN-based connectivity solutions.

Low Earth orbit (LEO) satellite and high-altitude platform station (HAPS) providers have attracted much attention on the back of significant investments and technical breakthroughs that improve the business case for delivering connectivity at scale. A key selling point for aerial connectivity solutions is the potential to provide ubiquitous coverage all over the globe.

Terrestrial networks now cover more than 95% of the world's population but less than 45% of the world's landmass. Satellites and NTNs are well suited to deliver connectivity in maritime, remote and polar areas, where deploying conventional terrestrial networks could be costly and challenging.

The 3GPP has laid the foundation for satellite-based connectivity through standardisation to extend the reach of 5G to regions lacking terrestrial infrastructure. Four broad use cases have been identified:

- **Service continuity**: For coverage where it is not feasible with terrestrial networks, such as maritime or remote areas.
- **Service ubiquity:** For mission-critical communications, such as for disaster relief during outage of terrestrial networks.
- **Service scalability:** For services that can be more efficiently supported via satellite, such as multicasting/broadcasting of similar content over a large area.
- **Backhaul services:** For transport for sites with weak or no backhaul capacity.

# Europe aims to keep pace with satellite connectivity

Authorities in China and the US have taken a strategic interest in the development of satellite constellations to meet data processing and connectivity needs, with considerable public and private investments into various initiatives. For example, the Chinese government expects the total capacity of the country's high-orbit satellites to exceed 500 Gbps by the end of its 14th Five-Year Plan (2021–2025), while several state-backed Chinese entities have announced plans to launch more than 26,000 LEO satellites for internet connectivity in the coming years. Meanwhile, the US is home to some of the world's leading LEO satellite providers, notably Starlink, AST SpaceMobile, Lynk Global and Amazon's Project Kuiper, with around 7,000 satellites already in orbit and many more planned in the coming years.

Recent developments suggest that European authorities are taking steps to keep pace with their global peers in the development and application of satellite connectivity. For example, in October 2024, the European Commission awarded a contract to the SpaceRISE consortium to develop, deploy and operate the Union's secure connectivity satellite system, IRIS[2] (Infrastructure for Resilience, Interconnectivity and Security by Satellite). The consortium is composed of European satellite operators SES, Eutelsat and Hispasat, with a core team of associated partners from different segments of the ecosystem, including telecoms operators Deutsche Telekom and Orange.

The emergence of new players across the European satellite ecosystem demonstrates a growing interest and positive outlook for the role of satellites, and aerial technologies more broadly, in the future connectivity landscape. Recently, French startup Constellation Technologies & Operations raised €9.3 million in funding to conduct its first end-to-end connectivity tests, which aims to provide low-latency internet services for telecoms operators, while FOSSA Systems, a Spanish operator of picosatellites, has secured funds to start offering full commercial connectivity services for remote monitoring and tracking devices.

# A new era of telco-satellite partnerships

The advent of LEO and HAPS solutions has ushered in a new era of collaboration between telecoms and satellite operators for solutions spanning several use cases, including remote area connectivity, disaster response and maritime services. Examples of partnerships and other recent activities include the following:

- **Vodafone** and **Intelsat** have extended their partnership to offer wider coverage of temporary and on-the-move satellite connectivity services to organisations operating in hard-to-reach areas or disaster zones.

- **Orange** has partnered with **OneWeb** to improve and expand its overall connectivity, particularly in rural and remote areas across Europe and other regions. The partnership allows Orange to offer enriched connectivity to enterprise customers and improve backhauling in remote locations.

- **Virgin Media O2** is using **Starlink's** LEO satellites to provide mobile backhaul for remote regions of the UK, with a view to accelerating its shared rural network rollout. The operator has deployed Starlink for mobile backhaul solutions in the Scottish Highlands, which would be difficult or impossible to connect using fibre or microwave solutions.

- **Deutsche Telekom, Qualcomm** and **Skylo** successfully completed an end-to-end trial of SMS send and receipt over a geostationary orbit (GEO) satellite. The companies claimed it is the first time in Europe that an operator's terrestrial mobile network has been integrated into a satellite network to enable texting based on the 3GPP Release 17 specifications for direct-to-device connectivity.

These developments underline the importance of collaboration between telecoms and satellite operators to maximise the potential of aerial connectivity in a way that is mutually beneficial and supplemental to mobile services. For telecoms operators, satellite and NTN connectivity enables access to new customers in underserved areas and the capability to provide connectivity in remote areas. For satellite providers, operators' existing relationships with end users and, where relevant, existing spectrum holdings is crucial for satellite solutions to scale. GSMA Intelligence estimates a total incremental revenue opportunity from satellite-to-phone services of over $30 billion for telecoms operators by 2035.

# 03

## Mobile industry impact

# 3.1
# The mobile industry's impact on the SDGs

The mobile industry continues to expand its impact on the UN Sustainable Development Goals (SDGs), driven by the increased reach of mobile networks and growing take-up of mobile internet services.

SDG 7: Affordable and Clean Energy, SDG 6: Clean Water and Sanitation and SDG 3: Good Health and Well-being) have seen the biggest improvement in mobile industry impact score, according to GSMA research.[7]

Figure 20
**Mobile's impact on the SDGs in Europe**

Most improved SDGs

**7** AFFORDABLE AND CLEAN ENERGY

**6** CLEAN WATER AND SANITATION

**3** GOOD HEALTH AND WELL-BEING

Source: GSMA Intelligence

## European operators are leaders in climate action

Operators in Europe are leading the way on climate action, with operational emissions per connection reduced by over 50% between 2019 and 2022. Operators collectively purchased a record 22 TWh of renewable electricity, accounting for 40% of the global telecoms renewable energy total.[8] The majority of operational emissions came from generated and purchased electricity.

Operators are focused on energy efficiency and renewable energy to reduce emissions, particularly within network operations. The EU's robust renewable energy policies have driven operators to adopt impactful energy purchasing strategies, advancing progress towards SDG 7, which aims to ensure access to affordable, reliable, sustainable and modern energy for all.

7. 2024 Mobile Industry Impact Report: Sustainable Development Goals, GSMA, 2024
8. Mobile Net Zero 2024, GSMA, 2024

## Deutsche Telekom's renewables and energy efficiency strategies

Energy efficiency is one of the four pillars of Deutsche Telekom's climate strategy and an integral lever to achieve its net-zero targets. In 2023, the operator announced a new, ambitious net-zero target: to reduce its value-chain emissions by 55% until 2030 and reach net zero across the whole value chain by 2040.

A major focus has been on making network operations more energy efficient through innovations and technology upgrades.

For instance, Deutsche Telekom's Cell-Sleep Mode allows antennas to partially power down when full capacity isn't needed, leading to a 13 GWh energy saving in Germany alone and over 50 GWh across its operations. In addition to these efforts, Deutsche Telekom signed a power purchase agreement in 2023 to support a new offshore wind farm, which is expected to add 400 GWh of renewable energy annually to the grid, underscoring the operator's commitment to renewable energy expansion.

## Water management with connectivity

SDG 6 focuses on ensuring the availability and sustainable management of water and sanitation for all. Mobile technology improves many aspects of water delivery and sanitation provisioning. Effective metering and revenue collection are central to a healthy, functioning water utility. At the same time, IoT solutions such as smart meters deployed by operators are helping to understand consumption behaviours to drive efficiencies in the energy and water sectors. The mobile industry in Europe is increasingly driving deployment of smart solutions, especially for digital utilities, by leveraging 5G in IoT solutions. Some recent examples on water management initiatives are as follows:

- **LMT's smart water meters in Latvia:** LMT has installed 770 ultrasonic NB-IoT water meters across two towns in Latvia, which automate billing, reduce manual reading time and streamline invoicing. LMT plans to add 4,040 more meters over the next four years, enabling efficient resource management in municipalities.

- **BT's IoT and AI collaboration with Yorkshire Water:** BT collaborated with Yorkshire Water in the UK to install IoT monitors on water courses feeding the reservoir to help remotely monitor water quality. Supported by an EE mast installed nearby, the system provides connectivity for the sensors to relay data back to Yorkshire Water – where scientists and engineers use it for improved decision-making. The availability of better insights on water quality can have a knock-on impact on the carbon footprint of Yorkshire Water. Additionally, BT's AI technology is being trialled with Severn Trent in Derbyshire to autonomously manage wastewater, helping to prevent flooding and pollution through predictive maintenance. The AI technology will be deployed on pumping stations and will operate independently, using monitors, and provide forecasting. The aim is to see if it can predict issues, such as storm-weather conditions, before they occur.

# Operators supporting healthcare delivery

Operators contribute to SDG 3 by enhancing healthcare through the use of 5G and AI. Mobile technology helps to secure healthcare financing, optimises healthcare service delivery, provides health workers with enhanced skills and supports the infrastructure needed for the health information system and early detection of diseases through analytics. In Europe, operators are not only providing connectivity to health services solutions but also driving health care projects, such as with the following examples:

- **Nos's 5G healthcare project:** Nos is leading a 5G healthcare project in Portugal with support from the European Commission. Using 5G technology and with an investment of over €3.3 million, the project will implement six use cases, including VR for intensive care, connected emergency medical vehicles, robotic surgery, telemedicine, health monitoring and remote diagnostics. These 5G-enabled services aim to elevate patient care through real-time connectivity.

- **Telefónica's 3D robotics surgery:** Telefónica and the Germans Trias Hospital in Barcelona have developed a pilot of 3D immersive robotic surgery and training with the Da Vinci surgical system. The project was carried out in collaboration with Abex Excelencia Robotica and mSurgery. The solution uses a combination of technologies such as 5G, VR/AR and edge computing, enabling real-time connectivity and the remote operation of a robotic system with 3D vision. This set-up also allows for remote training participation via VR headsets and tablets, enhancing learning and care delivery.
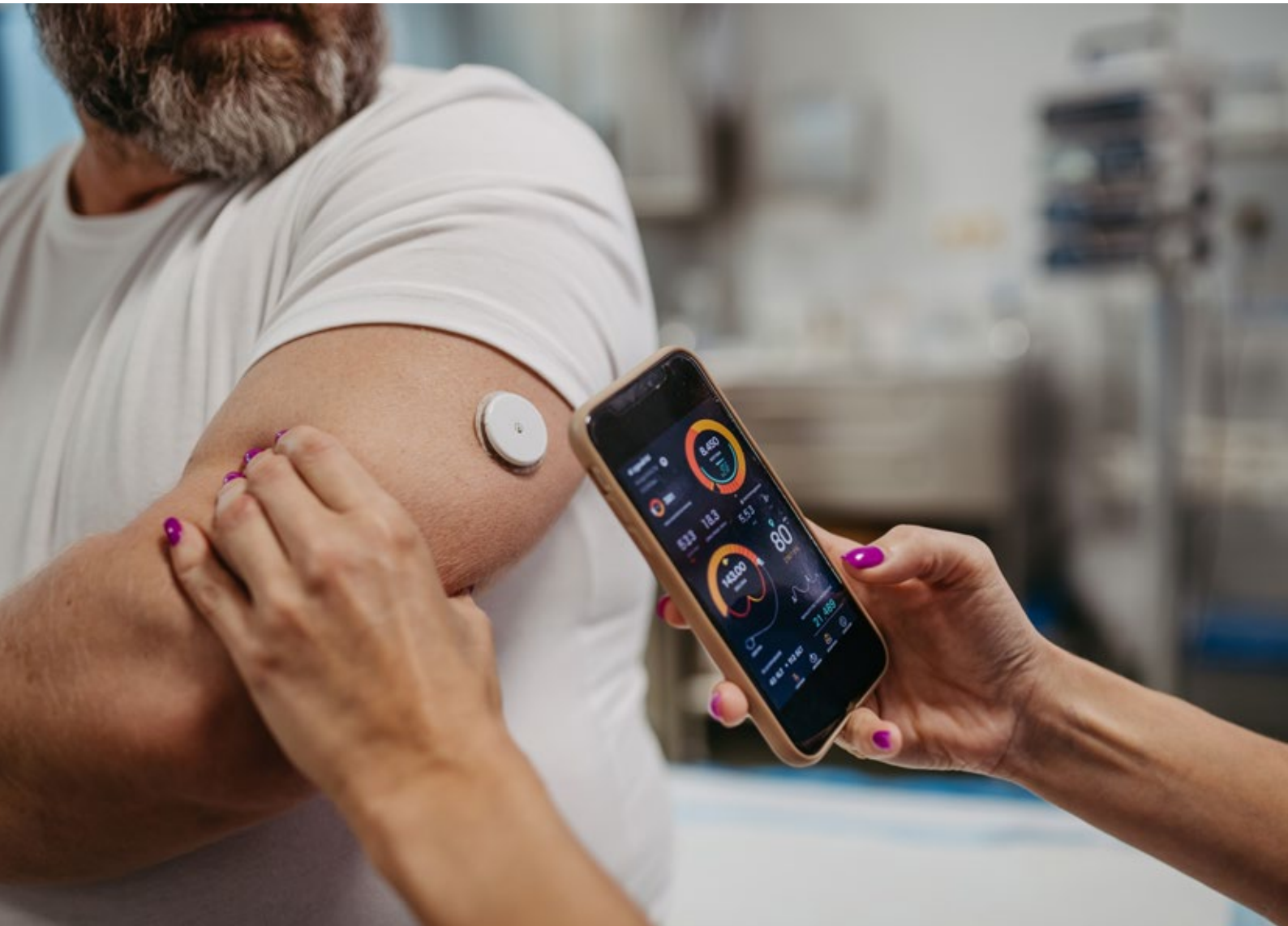
# 3.2
# Supporting responsible mobile internet use among children

Children with internet access are often some of the most frequent users of digital technologies, both at home and school.[9] Mobile technology offers various benefits, including expanded entertainment, innovative learning opportunities, exposure to diverse cultures and avenues for creative expression. Proficiency in digital technology is increasingly essential for participating and thriving in today's economy, and many children are well positioned to benefit. In 2023, the GSMA reported that over half of children aged 5–17, or approximately 900 million globally, used mobile internet, with around two thirds accessing it on personal or primary-use devices. In Europe and Central Asia, over 80% of children used mobile internet.[10]

While the use of mobile internet among children is growing, it is important to address the inequalities among children that exist both between and within countries. Without equitable access, these disparities can deepen the digital divide, potentially excluding individuals from an increasingly connected society. In 2021, the UN Committee on the Rights of the Child published guidance for governments on children's rights in relation to the digital environment.[11] It noted that as a matter of non-discrimination, governments must ensure all children have equal and effective access to the digital environment, which is becoming increasingly important across most aspects of children's lives.

At the same time, the digital environment poses risks, such as age-inappropriate content and online exploitation. The GSMA's mPower Youth initiative,[12] which adopts a rights-based approach, aims to maximise digital opportunities for young users while addressing the associated risks. Operators in Europe are also taking proactive steps by undertaking various initiatives, providing guidance and helping parents with appropriate education and on cyberbullying. For instance, EE introduced age-specific smartphone usage guidelines in August 2024 to address parental concerns about screen time and child well-being. Deutsche Telekom's Teachtoday initiative offers practical resources to support media literacy among children and adults, providing tips for parents and teachers on media education. This initiative also aligns with Deutsche Telekom's ongoing campaign against disinformation, emphasising safe and informed internet use.

Furthermore, GSMA Mobile Alliance members are collaborating with one another and engaging key national and international stakeholders to create a unified response to digital child sexual exploitation and abuse. This cooperative effort aims to combat the challenges posed by digitally facilitated harm against children and ensure their safety in the online environment.[13]

9.   Children and digital technologies: Trends and outcomes, OECD, 2020
10.  The State Of Mobile Internet Connectivity 2024, GSMA, 2024
11.  General comment No. 25 (2021) on children's rights in relation to the digital environment, Office of the United Nations High Commissioner for Human Rights, March 2021
12.  www.gsma.com/mpoweryouth/
13.  "GSMA Mobile Alliance to combat Digital Child Sexual Exploitation", GSMA, February 2024

# 04

## Mobile industry enablers

Europe finds itself at a pivotal moment, facing increased global competition, rising trade barriers and a race for technological supremacy. At the same time, over-regulation and a raft of structural issues continue to strangle investment and limit the telecoms sector's ability to lead in innovation and achieve the productivity gains that Europe needs.

As the Union enters a new parliamentary term, resolving these underlying issues needs to be a priority for the European Commission and other authorities. This means urgently implementing critical policy reforms to ensure that Europe's digital economy, underpinned by strong, sustained network innovation, can re-establish a leadership position in the global tech race by 2030.

# 4.1
# Boosting Europe's global competitiveness

European operators' ability to invest significantly and sustainably in digital infrastructure is inhibited by a lack of scaling opportunities, a fragmented telecoms market and a regulatory framework long in need of an overhaul, considering the monumental technological and market shifts that have manifested over the past decade. These industry challenges should be addressed by the European Commission early in its new mandate. The GSMA and its European operator members strongly recommend that the Commission move ahead with a legislative proposal – a Digital Networks Act.

In September 2024, the European Commission published Mario Draghi's report on the future of European competitiveness.[14] The report highlights the profound innovation and investment gap in digital infrastructure between Europe and its global competitors. Today, for every 100,000 EU citizens, there are around 100 5G mobile base stations, compared to 245 and nearly 600 5G mobile base stations in China and South Korea, respectively.[15] In addition, 5G mid-band coverage, which is ideal for bringing fast, low-latency connectivity to urban areas, is around 45% in Europe but 90% in North America and 95% in China.[16]

Addressing Europe's digital infrastructure needs is an important first step towards resetting the regulatory framework for telecommunications and re-energising the European telecoms sector as an engine of competitiveness and prosperity. The benefits of improved investment in digital infrastructure will not only be felt across the telecoms and technology sectors but across every other industry. To this end, Europe needs to act swiftly on measures to achieve a competitive, secure and sustainable European single market and future visions such as the provision of cross-border services. This requires a bold new approach underpinned by efforts to:

• complete the digital single market

• implement additional measures needed to ensure fairness in the internet value chain

• take a more long-term view on investment and innovation effects

• establish a pro-investment approach to EU spectrum policy

• support sustainability efforts of mobile operators.

14. The future of European competitiveness: Part A, European Commission, 2024
15. https://5gobservatory.eu/observatory-overview/interactive-5g-scoreboard/
16. Ericsson Mobility Report, Ericsson, November 2024

# Complete the digital single market

Despite the objective of ensuring more harmonisation, the European telecoms single market has not emerged. The regulatory framework, primarily defined by the European Electronic Communications Code (EECC), is a directive with national implementation, and telcos are additionally subject to a range of non-sector-specific nationally implemented laws.

At the same time, profound changes have taken place in the market, with new technologies and use cases that have opened up for a range of new players offering equivalent and competing (i.e. over-the-top) communications services or complementary services (e.g. cloud service providers, content delivery network (CDN) providers). Despite their increasing role in the telecoms market, these players are not regulated in the same way as telcos.

As a consequence, there is neither a telecoms single market nor a level regulatory playing field. The European telecoms industry could improve efficiencies and regain strength if it could develop and deploy certain services on a cross-border or even pan-EU basis. In particular, the industry would benefit from reforms that can correct inconsistencies in the regulation and reduce barriers to enable a true single digital market. Key actions include:

- addressing technological development by assessing whether some of the principles in the telecoms regulatory framework should be applied to other parts of the connectivity value chain

- streamlining regulation where possible by assessing in detail whether certain areas of the sector-specific consumer law can be removed in light of horizontal existing legislation

- achieving greater harmonisation and removing barriers to the single market by further harmonising the remaining sector-specific rules (e.g. in consumer protection and security law) and by issuing further implementation guidance and encouraging member states to follow best practices in their implementation of certain regulatory measures.

# Implement additional measures needed to ensure fairness in the internet value chain

With changes in the competitive dynamics and bargaining power between traditional network operators and large content and application providers (CAPs) – and with increasing data traffic volumes driven by the growth of online services and media and new business cases and technologies – network operators are handling an ever-increasing amount of traffic on their networks. This traffic primarily stems from a handful of CAPs, which are responsible for more than two thirds of global mobile traffic.[17]

The European Commission's consideration of policy measures to ensure the swift resolution of eventual disputes in commercial negotiations between parties in the IP interconnection (IP-IC) market is a positive step. Such a policy measure could be achieved by defining an obligation on CAPs to negotiate with internet service providers (ISPs) on the terms and conditions for IP data transport services (at a fair and reasonable price), thereby making the negotiating parties subject to a dispute resolution process in the event that an agreement cannot be reached.

Reaching an agreement on the terms of transport services would promote sustainable network investment by enhancing the profitability of network deployments, thereby making them more appealing to investors. Additionally, fostering traffic efficiency by traffic generators could further ease pressure on network investments requirements and help mitigate the environmental impact.

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17.  2024 Global Internet Phenomena Report, Sandvine, 2024

## Take a longer-term view on investment and innovation effects

Creating a secure, resilient and technologically competitive telecoms industry will require investment. The telecoms industry can only cope with these high investment needs if there is sufficient return on the investments, which in turn can only be achieved if there is enough scale in the form of additional customers on the same network. For the mobile economy to achieve the growth expectations outlined in this report, securing this supportive policy framework is of paramount importance.

With the largest investments made in access networks, economies of scale are first and foremost local, making in-market consolidation imperative based on long-term investments and innovation effects. Once the necessary scale for profitability is achieved, it will become possible for operators to better compete globally in digital markets that require pan-EU scale. This long-term viewpoint is also reflected in the investor feedback that the Commission refers to in its white paper.[18]

It is therefore necessary for the Commission to initiate a review of the EU Merger Regulation, which has not been reviewed for 20 years, in order to put more emphasis on the long-term investment viewpoint. This would also enable European telecoms operators to build scale through in-market consolidation. Scale is critical to foster the significant investment needed to deliver better outcomes for European consumers, to ensure that European telecoms operators remain independent and financially secure and to make sure technological challenges can be addressed. In addition, addressing barriers to the single market could unlock cross-border efficiencies that might foster cross-border consolidation in the long term.

## Establish a pro-investment approach to EU spectrum policy

Spectrum is vital for the telecoms industry. Addressing the risk of financial burden by adopting a more investment-friendly and predictable approach to EU spectrum policy is a main aspect of advancing Europe's digital connectivity objectives. This includes a harmonised approach to spectrum auctions, licensing costs, prolongation of licences and identification of future bands.

All these areas must come together as countries look to assign more spectrum across low, mid- and high bands – spectrum that is needed to keep up with data demand, increased 5G adoption and the advent of future technologies.

Following the World Radiocommunication Conference 2023 (WRC-23), 6 GHz has become the harmonised future home of mid-band capacity.[19] Equipment using 6 GHz has been trialled and, in other parts of the world, it is already being added to roadmaps and assigned.[20]

Progress is also needed on low bands to help drive digital equality. The UHF range, including the 600 MHz band, requires a deadline during this decade for the Commission to put forward proposals to reduce barriers to the introduction of mobile services in interested member states.

## Support sustainability efforts of mobile operators

Mobile operators are working on reducing their carbon footprint by optimising network operations, energy consumption and the amount of network equipment deployed based on actual and timely demands. Policymakers have a role to play in supporting these efforts by operators.

Policymakers should launch initiatives that can enhance data efficiency through relevant economic signals for bandwidth usage and via efficient codecs and data-saving mode by default. They should also extend circular economy principles to network equipment and the EU taxonomy for green investment in electronic communication networks, based on robust metrics.

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18.  White Paper - How to master Europe's digital infrastructure needs?, European Commission, 2024
19.  The Importance of 6 GHz to Mobile Evolution, GSMA, 2024
20.  "GSMA hails groundbreaking spectrum decisions at WRC 23", December 2023